Law Commission
Reforming the law

Smart legal contracts
Advice to Government

CP 563

Law Com No 401

Smart legal contracts Advice to Government

Presented to Parliament

by the Lord Chancellor and Secretary of State for Justice

by Command of Her Majesty

November 2021

CP 563

This publication is available at www.gov.uk/official-documents.

Any enquiries regarding this publication should be sent to us at enquiries@lawcommission.gov.uk.

ISBN 978-1-5286-3007-8

E02694059 11/21

Printed on paper containing 75% recycled fibre content minimum

Printed in the UK by HH Associates Ltd. on behalf of the Controller of Her Majesty's Stationery Office

The Law Commission

The Law Commission was set up by the Law Commissions Act 1965 for the purpose of promoting the reform of the law.

The Law Commissioners are:

The Right Honourable Lord Justice Green, Chairman

Professor Sarah Green

Professor Nicholas Hopkins

Professor Penney Lewis

Nicholas Paines QC

The Chief Executive of the Law Commission is Phil Golding.

The Law Commission is located at 1st Floor, Tower, 52 Queen Anne's Gate, London SW1H 9AG.

The terms of this paper were agreed on 13 October 2021.

The text of this paper is available on the Law Commission's website at https://www.lawcom.gov.uk/project/smart-contracts/.

Contents

Glossary

Term	Definition
Algorithm	A set of mathematical instructions that must be followed in a fixed order and, if given to a computer, will calculate an answer to a mathematical problem.
Bitcoin	A type of cryptocurrency which is supported by blockchain.
Bitcoin blockchain or network	A blockchain which records transactions in the bitcoin cryptocurrency.
Blockchain	A method of recording data in a structured way. Data (which may be recorded on a database or ledger) is usually grouped into timestamped “blocks” which are mathematically linked or “chained” to the preceding block, back to the original or “genesis” block.
Code	A language used to give instructions to computers.
Computer program	A collection of instructions written in code that are executed by a computer.
Consensus mechanism	The process by which participants on a DLT system reach consensus that a new data entry should be recorded on the ledger. The consensus mechanism is set by the software underlying the DLT system.
Cryptoasset	A digital asset created or implemented using cryptographic techniques.
Cryptocurrency	A form of cryptoasset which is used as a medium of exchange on a DLT system. Bitcoin and Ether are examples of cryptocurrencies.
Distributed ledger	A digital store of information or data. A distributed ledger is shared (that is, “distributed”) amongst a network of computers (known as “nodes”) and may be available to other participants. Participants approve and eventually synchronise additions to the ledger through an agreed consensus mechanism.

Distributed ledger technology ("DLT")	Technology that enables the operation and use of a distributed ledger.
Ether	The native cryptocurrency of the Ethereum network.
Ethereum	A blockchain based, permissionless, public DLT system.
Fiat currency	Currency that is issued by a government and is accepted to have value independently of the material from which it is made.
Hybrid contract	A smart legal contract, some terms of which are defined in natural language and other terms of which are defined in the code of a computer program. Some or all of the contractual obligations are performed automatically by the code. In addition, the same contractual term(s) can be written in both natural language and in code.
Mining	The process by which participants on a DLT system solve a computationally intensive mathematical problem so that data can be added to the distributed ledger. Mining is typically a feature of permissionless DLT systems, which require participants to solve mathematical problems as part of the consensus mechanism. Permissioned DLT systems may use different consensus mechanisms, and so may not necessarily involve mining.
Natural language	Language that has developed in the usual way as a method of communicating between people, rather than language that has been created for a specific purpose or application.
Natural language contract/traditional contract	A contract in which all of the terms are recorded in natural language, either orally or in writing.
Node	A participant in a DLT system.
Off-chain / on-chain	"Off-chain" refers to actions or transactions that are external to the distributed ledger or blockchain. "On-chain" refers to actions or transactions that are recorded on the distributed ledger or blockchain.
Oracle	An external data source which transmits information to a computer program.
Permissioned	Requiring authorisation to perform a particular activity.

Permissionless	Not requiring authorisation to perform a particular activity.
Permissioned DLT system	A DLT system in which authorisation to perform a particular activity on the system is required.
Permissionless DLT system	A DLT system in which authorisation to perform a particular activity on the system is not required.
Private DLT system	A DLT system which is accessible for use by a limited group of participants.
Private key	A string of data that is unique to a participant on a distributed ledger and is known only to the participant. A participant can digitally sign a transaction by combining the transaction data with their private key.
Pseudonymity	The practice of using a false or fictitious identifier which conceals a person's real identity.
Public DLT system	A DLT system which is accessible for use by the public.
Public key	A string of data that is unique to a participant on a distributed ledger and is shared with other participants. A participant's public key can be used by the recipient of a transaction to confirm the authenticity of the transaction.
Smart contract	Computer code that, upon the occurrence of a specified condition or conditions, is capable of running automatically according to pre-specified functions.
Smart contract platform	A DLT or other network upon which a smart contract may be deployed.
Smart legal contract	A legally binding contract in which some or all of the contractual terms are defined in and/or performed automatically by a computer program. There are essentially three forms a smart legal contract can take, depending on the role played by the code. These are: • natural language contract with automated performance; • hybrid contract; or • solely code contract.

Solely code contract	A smart legal contract in which all of the contractual terms are defined in, and performed automatically by, the code of a computer program.
Token	A type of digital asset. A token typically represents something else that exists either digitally or physically.
UKJT Legal Statement	UK Jurisdiction Taskforce, *Legal statement on cryptoassets and smart contracts* (2019).
Unilateral contract	A contract where one party (the offeror) makes a promise in return for performance by the other party (the offeree), but the offeree does not promise to perform so that only the offeror is bound under the contract. The contract forms when the offeree fulfils the specified condition.

Abbreviations

Abbreviation	Meaning
1967 Act	Misrepresentation Act 1967
2019 report	Electronic Execution of Documents (2019) Law Com No 386, https://www.lawcom.gov.uk/project/electronic-execution-of-documents/
AES	Advanced electronic signature
CCRs	The Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013, SI 2013 No 3134
CJEU	Court of Justice of the European Union
CPRs	The Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277
CRA 2015	Consumer Rights Act 2015
DLT	Distributed ledger technology
EDI	Electronic Data Interchange
eIDAS	Regulation on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC (EU) No 910/2014 Official Journal L 257/73 of 28.08.2014
EU	European Union
QES	Qualified electronic signature
UKJT	UK Jurisdiction Taskforce of the Lawtech Delivery Panel

ONLINE CONTENT

All websites referenced in this document were last accessed on 18 November 2021.

Smart legal contracts

To the Right Honourable Dominic Raab MP, Lord Chancellor and Secretary of State for Justice

Chapter 1: Introduction

SMART LEGAL CONTRACTS

1.1 Emerging technologies, such as distributed ledgers, are increasingly used to create "smart contracts": computer programs which run automatically, in whole or in part, without the need for human intervention. Smart contracts can perform transactions on decentralised cryptocurrency exchanges, facilitate games and the exchange of collectibles between participants on a distributed ledger, and run online gambling programs.

1.2 Smart contracts can also be used to define and perform the obligations of a legally binding contract. It is this specific type of smart contract – a "smart legal contract" – that is the object of our analysis. For the purposes of this paper, we define a smart legal contract as a legally binding contract in which some or all of the contractual obligations are defined in and/or performed automatically by a computer program.[1] Smart contracts, including smart legal contracts, tend to follow a conditional logic with specific and objective inputs: if "X" occurs, then execute step "Y".

1.3 Smart legal contracts are expected to revolutionise the way we do business, particularly by increasing efficiency and transparency in transactions. They are increasingly being considered by contracting parties as a means of automating specific processes within conventional contracts, from payment of insurance claims to managing supply chains. Currently, smart legal contracts are likely to be useful in respect of only fairly rudimentary agreements, such as to transfer an amount of cryptocurrency to a person's wallet when certain conditions are met. However, as the technology underpinning smart legal contracts becomes increasingly sophisticated, a greater range of obligations may be suitable for coding, resulting in these contracts becoming increasingly more complex and able to perform a greater range of tasks.

1.4 Smart legal contracts can take a variety of forms with varying degrees of automation.[2] In the first instance, a smart legal contract may take the form of a natural language agreement with performance automated by code. Alternatively, a smart legal contract may be written solely in (and performed by) code. In between these two extremes, a smart legal contract may take the form of a hybrid contract, consisting of both natural

---

1 We discuss the three forms of smart legal contract in more detail from para 2.51.

2 We discuss the three forms of smart legal contract in more detail from para 2.51. We discuss automaticity in more detail from para 2.14.

language and coded terms. Different forms of smart legal contract give rise to different legal considerations.

1.5 Automation should be considered on a spectrum. Smart legal contracts which involve elements of standard automation, such as payment by way of direct debit, have been in use for many years and are therefore unlikely to give rise to novel legal issues. However, a smart legal contract drafted primarily or solely in code and recorded on a distributed ledger, is likely to give rise to novel legal questions; the automation in question takes the contract out of the realm of legal familiarity.

THIS PROJECT

Background

1.6 The Law Commission was asked by the Lord Chancellor to include work on smart legal contracts as part of our 13th programme, agreed in December 2017. After discussions with stakeholders, our initial intention was to publish a call for evidence in January 2019.

1.7 In the same period, the Lawtech Delivery Panel was created with the support of Government.[3] There was clearly some common ground between the proposed Law Commission work and that of the Delivery Panel, and in particular its UK Jurisdiction Taskforce ("UKJT"). In those circumstances, we agreed to pause our work until such time as the conclusions of the UKJT were known.[4]

1.8 In November 2019, the UKJT published its legal statement on cryptoassets and smart contracts.[5] The UKJT Legal Statement concluded that, in principle, smart contracts are capable of giving rise to binding legal obligations, enforceable in accordance with their terms. Following this, the Ministry of Justice asked the Law Commission to undertake a scoping study on smart legal contracts.

1.9 The purpose of the scoping exercise is to provide an analysis of the current law as it applies to smart legal contracts, highlighting any uncertainties or gaps, and identifying such further work as may be required now or in the future. The project is intended to build on the foundations laid by the UKJT Legal Statement, and consider additional questions raised by stakeholders regarding smart legal contracts. Our terms of reference do not include other areas of law in so far as they relate to smart legal contracts, such as tax and data protection. Our full terms of reference are set out at Appendix 1.

Call for evidence

1.10 In December 2020, we published a call for evidence, which closed on 31 March 2021. The primary function of the call for evidence was to seek views about, and evidence of, the ways in which smart legal contracts were being used, and the extent to which

---

3 More information is available at https://technation.io/lawtechukpanel/.

4 The Chair of the Law Commission and the Commissioner for Commercial and Common Law both had observer status on the UKJT.

5 UK Jurisdiction Taskforce, *Legal statement on cryptoassets and smart contracts* (2019) ("UKJT Legal Statement"), https://35z8e83m1ih83drye280o9d1-wpengine.netdna-ssl.com/wp-content/uploads/2019/11/6.6056_JO_Cryptocurrencies_Statement_FINAL_WEB_111119-1.pdf.

the existing law could accommodate them. In each chapter of the call for evidence, we set out our understanding of law and practice, and asked consultees for their views. We did not make any proposals for law reform.

1.11 We received 47 responses to the call for evidence. The responses were from a mix of stakeholders, including individuals who responded in their personal capacity, individuals who responded on behalf of organisations, and academics. We summarise our findings and conclusions to the consultation exercise in this paper. A list of all consultees who responded to the call for evidence is set out in Appendix 2.

Extent

1.12 This project focuses on the law of England and Wales. International conventions, including the United Nations Convention on Contracts for the International Sale of Goods, are not considered.[6]

1.13 In relation to Wales, we consider that the subject matter of the project is reserved, being primarily a matter of private law.[7]

1.14 The project does not consider the law of Scotland or of Northern Ireland.

Activity in other jurisdictions

1.15 Some other countries have already taken steps to put smart legal contracts and associated concepts on a statutory footing. In addition, courts in other jurisdictions have had the opportunity to consider some of the issues that we discuss in this paper. Given the cross-border nature of many of the transactions which take place using smart legal contracts, it is and will continue to be important to be aware of developments elsewhere, with the hope that legal approaches will be broadly compatible. In the call for evidence, we asked consultees which other jurisdictions we should look to for their approach to smart legal contracts.[8]

1.16 Consultees noted that various states in the United States of America including Arizona, Illinois and Tennessee have introduced legislation which defines the term "smart contract", and provides that a contract is not to be denied legal effect solely because it is a smart contract.

1.17 Some consultees mentioned other jurisdictions which are perceived as being particularly proactive in the development and use of smart legal contracts and distributed ledger technology, including Australia, China, Dubai, Estonia, India, New Zealand, Sweden and Switzerland. Several consultees commented that Singapore is

---

6 The United Nations Convention on Contracts for the International Sale of Goods is a multilateral treaty that establishes a uniform framework for international commerce. It applies to contracts for the sale of goods between parties whose places of business are in different contracting states, or when the rules of private international law lead to the application of the law of a contracting state. It may also apply by virtue of the parties' choice. The United Kingdom has not ratified the convention, and is therefore not a contracting state. For more information see UNCITRAL, "United Nations Convention on Contracts for the International Sale of Goods (Vienna, 1980) (CISG)", https://uncitral.un.org/en/texts/salegoods/conventions/sale_of_goods/cisg.

7 Wales Act 2006, sch 7B, para 3(1). Private law is defined for this purpose as "the law of contract, agency, bailment, tort, unjust enrichment and restitution, property, trusts and succession": sch 7B, para 3(2).

8 Call for evidence, question 57, para 8.4.

particularly important because of its advanced use of smart legal contracts, and for its developing jurisprudence on smart legal contracts following High Court and Court of Appeal decisions in *Quoine Pte Ltd v B2C2 Ltd*.[9]

1.18 We refer to specific developments in other jurisdictions throughout this paper, where they are relevant to the particular issues being discussed.

Related work within the Law Commission

1.19 The UKJT Legal Statement also considered the legal status of cryptoassets. The Law Commission is currently working on a separate digital assets project drawing on this aspect of the UKJT Legal Statement. We published a call for evidence on digital assets in April 2021. We are analysing the responses received, and intend to publish a consultation paper next year.[10]

STRUCTURE OF THE PAPER

1.20 This paper analyses the current law as it applies to smart legal contracts, particularly in relation to:

(1) formation and enforceability, including in relation to deeds;

(2) interpretation;

(3) remedies;

(4) vitiating factors (mistake, misrepresentation, duress and undue influence);

(5) consumer protection; and

(6) jurisdiction.

1.21 It comprises six further chapters. In each chapter, we provide a summary of the responses we received to the various questions raised in the call for evidence. We build on additional insights provided by consultees, and provide more complex and detailed examples. We also explain where, and why, our thinking has changed and developed since the call for evidence, and draw on consultee views to inform our thinking and to formulate our conclusions.

1.22 In Chapter 2, we set out the background to smart legal contracts, our working definition of what a smart legal contract is, current use cases and a discussion of distributed ledger technology in the context of smart legal contracts. We include a discussion on the prevalence of the various forms of smart legal contracts, how they are used in practice, and the costs and benefits associated with smart legal contracts.

1.23 The next three chapters provide an analysis of the "lifecycle" of a contract formed under the law of England and Wales (from negotiation through to remedies for breach) and explain how the law might apply to smart legal contracts. Chapter 3 considers the

---

9 [2020] SGCA(I) 02.

10 More information and the latest updates are available on the Law Commission's digital assets project page, https://www.lawcom.gov.uk/project/digital-assets/.

formation of a smart legal contract, including whether the parties intended to enter into legal relations, with all the associated legal rules and remedies. In Chapter 4, we consider how the courts might interpret a smart legal contract, looking at existing principles of interpretation. In Chapter 5, we consider the remedies which might be relevant if things "go wrong", such as where the code does not execute as one or more of the parties intended.

1.24 In Chapter 6, we specifically consider potential issues for consumers who enter into smart legal contracts, and consider how existing consumer protections might apply in the context of smart legal contracts.

1.25 In Chapter 7, we consider the factors which may determine whether the courts of England and Wales have jurisdiction in relation to a smart legal contract, in the absence of a jurisdiction or choice of court agreement between the parties.

CONCLUSIONS AND FUTURE WORK

Existing legal principles can accommodate smart legal contracts

1.26 In this paper, we undertake a detailed analysis of the application of existing contract law to smart legal contracts. Our findings conclude that the current legal framework is clearly able to facilitate and support the use of smart legal contracts. Current legal principles can apply to smart legal contracts in much the same way as they do to traditional contracts, albeit with an incremental and principled development of the common law in specific contexts.[11] In general, difficulties associated with applying the existing law to smart legal contracts are not unique to them, and could equally arise in the context of traditional contracts. In addition, even though some types of smart legal contract may give rise to novel legal issues and factual scenarios, existing legal principles can accommodate them.

1.27 This paper therefore builds on the conclusions reached by the UKJT Legal Statement, which established that the current legal framework is sufficiently robust and adaptable so as to facilitate and support the use of smart legal contracts. The conclusions reached in this paper echo the view expressed by Sir Geoffrey Vos below.

> English law is in a good position to provide the necessary legal infrastructure to facilitate smart legal contracts if, but only if, we try to keep any necessary reforms simple. We should, I think, keep sharply in focus the advantages of the common law. It is dependable and predictable and able to build on clear principles so as to apply them to new commercial situations. We should, therefore, be looking to identify and, if necessary, remove any fundamental legal impediment to the use of smart contracts. We should try to avoid the creation of a new legal and regulatory regime that will discourage the use of new technologies rather than provide the foundation for them to flourish.[12]

---

11 For example, we discuss the merits of a limited common law development to the existing test for interpretation in the context of coded terms; see from para 4.32.

12 Sir Geoffrey Vos, "Cryptoassets as property: how can English law boost the confidence of would-be parties to smart legal contracts?" (2 May 2019) Joint Northern Chancery Bar Association and University of Liverpool Lecture, https://www.judiciary.uk/wp-content/uploads/2019/05/Sir-Geoffrey-Vos-Chancellor-of-the-High-Court-speech-on-cryptoassets-2.pdf.

1.28 The flexibility of our common law means that the jurisdiction of England and Wales provides an ideal platform for business and innovation, without the need for statutory law reform.

1.29 The market also has an opportunity to anticipate and cater for potential uncertainties in the legal treatment of smart legal contracts by encouraging parties to include express terms aimed at addressing them. Throughout the paper, we identify particular issues that parties may wish to address in their smart legal contract in order to promote certainty and party autonomy. A non-exhaustive list of these issues is set out in Appendix 3 to this paper. In addition, as smart legal contracts become increasingly prevalent, we anticipate that the market will develop established practices and model clauses that parties can make use of when negotiating and drafting their smart legal contracts. We hope that work in this area could be led by the UKJT or LawtechUK.[13]

1.30 We also consider separate, related areas of law, such as the law of deeds and the rules on jurisdiction. Deeds and private international law are the two areas where we think future work is required to support the use of smart contract technology in appropriate circumstances. In relation to both of these areas, future law reform projects are in train.

Related technological advancements

1.31 Smart legal contracts should not be considered in isolation. Related technological developments, such as the evolution of sophisticated smart contract platforms and the digitisation of contracts, have a direct bearing on smart legal contracts and their uptake. Digital contract initiatives and associated technologies are aimed at digitising commercial and legal documentation.[14] Rather than being written in natural language and stored as such, such technologies enable a contract to be produced in structured formats, with supporting code that acts as a map or set of instructions, enabling a computer to read it.[15] Legal documents produced in such a format can have their contents more easily read for reporting, analysis, automated processing, and lifecycle management.[16] Even though a digital contract does not need to be a smart legal contract, digital contracts will likely trend towards the inclusion of coded elements. Although these developments are outside the scope of this paper, it is worth noting their advancements.

1.32 The development of smart legal contracts may introduce new issues and harms which the law needs to respond to. For example, oracles (external data sources which transmit information to a computer program) may require further consideration or indeed regulation. As technology and use cases develop, it will be important to keep

---

13 LawtechUK is a work programme that is helping transform the UK legal sector through tech, and is delivered through a collaboration between Tech Nation, the LawtechUK Delivery Panel and the Ministry of Justice. For more information see https://technation.io/lawtechuk/.

14 See, for example, the Legal Schema, which is an "open source initiative that provides a common language for creating and managing legal documents as data": https://legalschema.org/docs/.

15 N Hilborne, "Structured data format a 'great step forward' for digital contracts" (23 June 2021), https://www.legalfutures.co.uk/latest-news/structured-data-format-a-great-step-forward-for-digital-contracts.

16 N Hilborne, "Structured data format a 'great step forward' for digital contracts" (23 June 2021), https://www.legalfutures.co.uk/latest-news/structured-data-format-a-great-step-forward-for-digital-contracts.

the law under review, and consider whether reform or regulatory intervention is necessary to address novel issues which arise.

ACKNOWLEDGEMENTS AND THANKS

1.33 We are grateful to all those individuals and organisations who responded to our call for evidence, as well as to those who have taken time to discuss the paper with us. Appendix 2 contains a list of consultees who responded to the call for evidence, and a separate list of those who we have spoken to directly during the course of this project.

THE TEAM WORKING ON THE PROJECT

1.34 The following members of the Commercial and Common Law Team have contributed to this paper: Laura Burgoyne (team manager); Daniella Lupini (team lawyer); Matthew Barry (research assistant); William Vaudry (research assistant) and Aparajita Arya (research assistant).

Chapter 2: What is a smart legal contract?

2.1 In this chapter, we begin by providing an introduction to code, and explaining what we mean by a smart legal contract in the context of this paper. We then outline the features of a smart legal contract, and the various forms that a smart legal contract can take, including the significance or otherwise of distributed ledger technology ("DLT") in the context of smart legal contracts.[17] We also identity, and provide examples of, the type of contractual terms that are most suitable for automation. Finally, we provide some context for the discussion on smart legal contracts by summarising use cases, and setting out the potential benefits and costs associated with the use of smart legal contracts.

2.2 Throughout the chapter, we summarise consultee views on the various questions that we asked in the smart contracts call for evidence.[18] Given the terminology used in our call for evidence, the term "smart contract" in a consultee response usually refers to what we, in this paper, call a "smart legal contract".

AN INTRODUCTION TO CODE

Computer programming languages

2.3 Code is, in its simplest form, a language used to give instructions to computers. A computer program is a collection of instructions written in code and executed by a computer. We understand that the process of drafting a computer program will normally involve two steps:

(1) drafting the code in a "high level" programming language, generally known as source code; and

(2) ultimately converting the source code into a "low level" programming language, generally known as machine code.[19] Typically, machine code is in binary form.

2.4 Computer programming languages "are the tools used to write instructions for computers to follow".[20] Programming languages can generally be classified as either "high level" or "low level".[21] High level programming languages, such as Python, C++

---

17 A distributed ledger is a digital store of information or data. It is shared (that is, "distributed") amongst a network of computers (known as "nodes") and may be available to other participants. Participants approve and eventually synchronise additions to the ledger through an agreed consensus mechanism. Distributed ledger technology is technology that enables the operation and use of a distributed ledger.

18 Smart Contracts (2020) Law Commission Call for Evidence ("call for evidence"), https://www.lawcom.gov.uk/project/smart-contracts/.

19 See UK Jurisdiction Taskforce, *Consultation paper: The status of cryptoassets, distributed ledger technology and smart contracts under English private law* (2019) p 31. The process of converting source code to machine code is generally known as "compiling".

20 Codecademy, "What is a programming language?" (23 March 2021), https://www.codecademy.com/resources/blog/programming-languages/.

21 Codecademy, "What is a programming language?" (23 March 2021), https://www.codecademy.com/resources/blog/programming-languages/.

and JavaScript,[22] make use of words and symbols. As D2 Legal Technology said in their response to the call for evidence, code written using high level programming languages are "designed to be read by people (albeit with a background in software development)".

2.5 An example of a low level programming language is machine code.[23] Machine code is generally expressed in binary form and constitutes the "instructions that a processor understands and can act upon".[24] Object code is a set of instructions generated in order to execute the high level source code. Object code may be low level machine code, or an intermediate, more human-readable, level instruction set. Similarly, assembly code "sits between machine code and high level language",[25] and makes use of mnemonics (that is, short abbreviations). Given their nature, low and intermediate level programming languages are generally more difficult (if not near impossible, in the case of machine code) for humans to read.

2.6 Generally, any code written in a high level programming language has to be translated into machine code before it can be executed by a computer. There are various types of translators, including compilers, interpreters and assemblers.[26] A compiler reads a programme in one language (for example, source code) and translates it into another language (for example, machine code).[27] Interpreters "directly execute the operations specified in the source programme on inputs supplied by the user".[28] Assemblers translate assembly code into machine code.[29]

Comments in source code

2.7 The following is an extract of source code from a computer program which applies a discount to the price payable under a contract for the shipment of perishable goods.[30] The source code provides that, if the temperature and humidity conditions on the shipment fall below a certain level (as detected by temperature and humidity sensors), the contract price is to be discounted using a formula.

```
contract PerishableGoods over PerishableGoodsContract {
  clause payout(request : ShipmentReceived) : PriceCalculation emits PaymentObligation {
    let zeroMoney = MonetaryAmount{
      doubleValue: 0.0,
```

22 Codecademy, "What programming languages are used in cybersecurity?" (15 June 2021), https://www.codecademy.com/resources/blog/what-programming-languages-are-used-in-cybersecurity/.

23 Isaac Computer Science, "Low-level languages", https://isaaccomputerscience.org/concepts/sys_proglang_low_level.

24 BBC Bitesize, "Translators and facilities of languages", https://www.bbc.co.uk/bitesize/guides/z6x26yc/revision/2.

25 BBC Bitesize, "Translators and facilities of languages", https://www.bbc.co.uk/bitesize/guides/z6x26yc/revision/3.

26 A Aho, M Lam, R Sethi and J Ullman, *Compilers: Principles, Techniques, and Tools* (2nd ed 2006) pp 1 to 3.

27 A Aho, M Lam, R Sethi and J Ullman, *Compilers: Principles, Techniques, and Tools* (2nd ed 2006) p 1.

28 A Aho, M Lam, R Sethi and J Ullman, *Compilers: Principles, Techniques, and Tools* (2nd ed 2006) p 3.

29 BBC Bitesize, "Translators and facilities of languages", https://www.bbc.co.uk/bitesize/guides/z6x26yc/revision/5.

30 We have reproduced this example courtesy of Peter Hunn and the Accord Project.

```
    currencyCode: contract.unitPrice.currencyCode
   };
   enforce isBefore(now(),contract.dueDate)
   else
                                return PriceCalculation{
            shipment : request.shipment,
            totalPrice : zeroMoney,
            discount : zeroMoney,
            late : true
           };

   // Guard against missing temperature readings
   let readings : SensorReading[] = request.shipment.sensorReadings ?? [];
   enforce readings != []
   else throw ErgoErrorResponse{ message : "No temperature readings received"};

   // Calculates payout
   let payOut = contract.unitPrice.doubleValue * integerToDouble(request.unitCount);

   // Calculates discount, if any
   let discount =
    calculateTempdiscount(contract.minTemperature,
                     contract.maxTemperature,
                     contract.discountFactor,
                     readings)
   + calculateHumdiscount(contract.minHumidity,
                     contract.maxHumidity,
                     contract.discountFactor,
                     readings);

   // Returns a price calculation, applying any discounts
   let totaldiscount = MonetaryAmount{
    doubleValue: discount * integerToDouble(request.unitCount),
    currencyCode: contract.unitPrice.currencyCode
   };
   let totalPrice = MonetaryAmount{
    doubleValue: max([payOut - totaldiscount.doubleValue, 0.0]),
    currencyCode: contract.unitPrice.currencyCode
   };
   emit PaymentObligation{
                                contract: contract,
                                promisor: some(contract.importer),
                                promisee: some(contract.grower),
                                deadline: none,
                                amount: totalPrice,
                                description: contract.importer.partyId ++ " should pay shipment amount to "
++ contract.grower.partyId
                     };
   return PriceCalculation{
    shipment : request.shipment,
    totalPrice : totalPrice,
    discount : totaldiscount,
    late : false
   }
  }
}
```

2.8 As the above example illustrates, source code generally contains a combination of words and symbols. In addition, natural language comments are frequently included in the code to explain its workings.

2.9 Commenting involves adding descriptions of the computer program, which can be read by a human person, to explain what the code is intended to do.[31] Comments are usually marked lines of text in the code (for example, by using the symbol "//") that are ignored (or not evaluated) by a computer.[32] A comment can be a "single line comment", which only applies to that line of code, or a "block comment" which applies to a paragraph of code.[33] In addition, parties can make use of "header comments" which provide a high level description of the computer program, who wrote it and what it is intended to do, as well as "section comments" to explain what a specific section of the code is intended to do.[34] In the code extract above, the wording following the symbols "//" indicates comments in the code. For example, "// Calculates discount if any" is an example of a heading comment that explains that that section of the code is directed at calculating any applicable discount to the contract price.

2.10 Good coding practice requires that computer programs should include comments to describe, in natural language, "the purpose of the code and any algorithms used to accomplish the purpose".[35] The use of comments in code assists with effective code maintenance, and provides the parties with additional flexibility in the coding process.

FEATURES OF A SMART LEGAL CONTRACT

2.11 For the purposes of this paper, we are concerned with what we are now calling smart legal contracts: legally binding contracts in which some or all of the contractual obligations are defined in and/or performed automatically by a computer program.

2.12 In the call for evidence, we identified three features of a smart legal contract:[36]

(1) some or all of the contractual obligations under the contract are performed automatically by a computer program ("automaticity");

(2) the contract is legally enforceable; and

(3) the computer program is deployed on a distributed ledger.

---

31 University of Utah School of Computing, "Commenting", https://www.cs.utah.edu/~germain/PPS/Topics/commenting.html.

32 University of Utah School of Computing, "Commenting", https://www.cs.utah.edu/~germain/PPS/Topics/commenting.html.

33 University of Utah School of Computing, "Commenting", https://www.cs.utah.edu/~germain/PPS/Topics/commenting.html.

34 University of Utah School of Computing, "Commenting", https://www.cs.utah.edu/~germain/PPS/Topics/commenting.html.

35 University of Utah School of Computing, "Commenting", https://www.cs.utah.edu/~germain/PPS/Topics/commenting.html.

36 Call for evidence, para 2.4.

2.13 We asked if consultees agreed that these three features were central to smart legal contracts, and asked various questions about how those features were encountered in practice. We discuss each element below, and explain how our thinking has developed, bearing in mind further research we have conducted and the views of consultees.

Automaticity

2.14 A distinctive feature of smart legal contracts is automaticity: some or all of the obligations under the contract are performed automatically without the need for human intervention.[37] The main benefit of automating a contractual obligation is that it enables contractual performance to occur without the need for human intervention. Unlike a human being, a properly coded computer program is simply unable to refuse to act or fail to perform.[38] Once the conditions for its performance are met, the computer program will perform the contractual obligation automatically.[39]

2.15 The use of computer programs to automate the performance of contractual obligations is not new. Automated bank payments (such as direct debits and standing orders) as well as online shopping all involve elements of automation at the instance of one or both of the parties. A contract in which a party decides to automate performance of the obligation to pay a sum of money by way of direct debit is a commonplace example of automation in the context of traditional contracts. In the call for evidence, we sought to differentiate these sorts of use cases from smart legal contracts.[40] However, having considered the issue further in light of consultees' responses to the call for evidence, we do not think it is necessary or desirable to attempt to do so for the purpose of this paper.

2.16 Instead of drawing bright line distinctions between smart legal contracts and non-smart legal contracts, we now think that automation should be considered on a spectrum, with certain types of smart legal contract sitting at one end of that spectrum. As Catherine Phillips said:

> Many types of contractual obligations 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.

2.17 Smart legal contracts which involve elements of standard automation, such as payment by way of direct debit, have been in use for many years. Owing to their familiarity and extensive use in practice, such contracts are unlikely to give rise to novel legal issues. Even though these types of smart legal contracts include an element of automation, the automation is merely a tool for performing the contract,

---

37 UKJT Legal Statement at [135].

38 S Green and A Sanitt, "Smart Contracts", in P Davies and M Raczynska (eds), *The Contents of Commercial Contracts: Terms Affecting Freedoms* (1st ed 2020).

39 For this reason, computer scientists sometimes refer to smart contracts as "self-executing" contracts. From a legal perspective, the "execution" of the computer program constitutes the performance of the contractual obligations.

40 Call for evidence, para 2.9.

and can easily be reversed.[41] At the other end of the spectrum, a smart legal contract may be drafted primarily or solely in code, and deployed on a DLT system. In these cases, where the automation in question takes the contract out of the realm of legal familiarity, novel legal issues may arise. This paper is concerned with identifying the characteristics of smart legal contracts that, due to their degree of automation, require different or novel legal responses.

Obligations suitable for automation

2.18 The automation of a contractual obligation by a computer program requires that the obligation be converted or translated into code.[42] Contractual obligations which follow a conditional logic ("if X, then Y") are good candidates for being drafted in code, as conditional logic is inherent in computer programming. Consultees agreed with this.[43] Cuneyt Eti referred to provisions of this kind as "operational clauses", and provided the following example: party A agrees to pay party B a certain amount of money on the last day of the month until the contract is terminated. Obligations of this kind lend themselves well to automation because they can easily be converted into code.[44]

2.19 Transpact and Catherine Phillips both provided the example of an escrow arrangement as being a suitable candidate for automation.[45] Catherine Phillips said that such arrangements are well suited for automation, provided that "the terms of the arrangement can be objectively measured". Transpact explained that their escrow offering involves three main steps. First, the buyer and the seller agree on the conditions for payment and associated terms in a natural language agreement. Second, once the terms have been agreed, the buyer makes the relevant payment to Transpact. Third, if the conditions for release of the funds to the seller are satisfied (such as delivery of the goods to the buyer's satisfaction), the funds are automatically transferred to the seller. If the conditions are not satisfied, the funds are returned to the buyer. Transpact said that the service is "largely automated and self-running, and requires little manual intervention".

---

41 See Expert Group on Regulatory Obstacles to Financial Innovation, *30 Recommendations on Regulation, Innovation and Finance - Final Report to the European Commission* (December 2019) p 33, https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/191113-report-expert-group-regulatory-obstacles-financial-innovation_en.pdf. The point made is that, originally, the term "smart contracts" referred to arrangements where the automated execution was "truly unstoppable". However, in practice, the term is now said to refer to arrangements "of automated execution generally, even if some parts of the process may require human input and control".

42 UKJT Legal Statement at [135].

43 We asked consultees what type of contractual obligations can currently be automated using computer programs, and to provide specific examples where possible: call for evidence, question 1 at para 2.12.

44 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 18, which makes the point that the smart contracts "called" or triggered on Ethereum are "auxiliary" smart contracts that perform basic functions, and which do not feature a great deal of complexity.

45 Broadly, escrow is a legal arrangement in which a third party temporarily holds sums of money or property until a particular condition has been met (such as the fulfilment of the conditions of a sale and purchase agreement). See also T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 17 which refers to smart contracts being used implement escrow systems.

Obligations ill-suited for automation

2.20 Some contractual obligations may not be suitable for automation by a computer program because they are not based on conditional logic, and are therefore difficult to translate into code. These include obligations that require the exercise of discretion, reasonableness, best endeavours or some element of human judgement. Consultees agreed with this, and said that contractual obligations less suited for automation were those that were imprecise, required interpretation or the exercise of discretion, and which were personal (for example, employment obligations). Cuneyt Eti referred to provisions of this kind as "non-operational clauses".

Legally enforceable

2.21 Our work focuses on smart contracts that constitute legally binding contracts. Under the law of England and Wales, there are several requirements for the formation of a legally enforceable contract: agreement, consideration, certainty and completeness, intention to create legally binding relations and compliance with formalities. Each of these requirements is discussed in Chapter 3.

Distributed ledger technology ("DLT")

What is DLT?

2.22 A distributed ledger is a digital store of information or data. It is shared (that is, "distributed") amongst a network of computers (known as "nodes") and may be available to other participants. DLT is technology that enables the operation and use of a distributed ledger.

2.23 The distinguishing feature of DLT compared to traditional, centralised databases is that the ledger is not maintained or controlled by a central administrator or entity. This means that network participants do not have to reconcile their local databases with a ledger maintained by the central administrator. Under traditional account-based transactions overseen by an intermediary, such as a bank, the authority to update the ledger is delegated to the bank. It is the bank who is responsible for updating the ledger by debiting the account of the payer, and crediting the account of the payee.[46]

2.24 Instead, in DLT systems, participants approve and eventually synchronise additions to the ledger through an agreed "consensus mechanism". The consensus mechanism is set by the software underlying the DLT system.[47] In general, it requires some or all of the participants to determine the validity of a proposed data entry.[48] If the participants determine that the proposed entry is valid, it is eventually added to the ledger. The consensus mechanism is typically designed so that, once data is added to the ledger,

---

46 Bank for International Settlements, BIS Working Papers No 924, *Permissioned distributed ledgers and the governance of money* (January 2021) p 2, https://www.bis.org/publ/work924.pdf.

47 World Bank, *Distributed Ledger Technology and Blockchain* (2017) p 6, https://olc.worldbank.org/system/files/122140-WP-PUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf.

48 World Bank, *Distributed Ledger Technology and Blockchain* (2017) p 6, https://olc.worldbank.org/system/files/122140-WP-PUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf.

the data is very difficult to amend.[49] The data is said to be "immutable". The immutability of the ledger means that participants in the system can trust in its veracity and transact with one another in confidence.

2.25 For example, the Bitcoin network uses a consensus mechanism based on "proof of work".[50] In this DLT system, a "block" of bitcoin transactions can only be added to the distributed ledger when a participant finds a solution to a mathematical problem. Broadly, this problem requires the participants to generate a number that falls within set parameters for the proposed block based on the preceding block of data (via a process called "hashing"). The process of finding a solution is known as "mining" and requires significant computational resources.[51] When a solution is found and verified by the nodes, the block is added to the ledger.[52]

2.26 The consensus mechanism operates to, among other things, verify that all the data on the Bitcoin blockchain is and remains mathematically linked.[53] Any alteration to the data of a given block would break the mathematical link between that block and all subsequent blocks on the ledger. Essentially, two competing versions of the ledger would arise: one chain containing the altered block and one containing the unaltered block.[54] Importantly, the Bitcoin network protocol rules include a rule that the longest chain of mathematically linked blocks is the only "valid" record of transactions. As such, if a participant wanted to alter the data on the ledger and have this recognised by the network, they would have to resolve the mathematical problem for all subsequent blocks on the ledger. This would involve adding new blocks to the ledger faster than the rest of the participants could do (so that its chain of blocks was the

---

49 The consensus mechanism may differ depending on whether the DLT system is "permissionless" or "permissioned": see from para 2.34.

50 Blockchain is a method of recording data in a structured way. Data (which may be recorded on a database or ledger) is usually grouped into timestamped "blocks" which are mathematically linked or "chained" to the preceding block, back to the original or "genesis" block. The Bitcoin blockchain is a blockchain which records transactions in the bitcoin cryptocurrency: see S Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) p 3, https://www.ussc.gov/sites/default/files/pdf/training/annual-national-training-seminar/2018/Emerging_Tech_Bitcoin_Crypto.pdf.

51 Participants are incentivised to engage in mining because they are rewarded with bitcoins upon generating a valid hash for a proposed block: S Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) p 4, https://www.ussc.gov/sites/default/files/pdf/training/annual-national-training-seminar/2018/Emerging_Tech_Bitcoin_Crypto.pdf; P de Filippi and A Wright, *Blockchain and the Law: The Rule of Code* (2018) pp 25 to 26.

52 The participants also check that the transacting participants have sufficient bitcoin in their accounts to engage in the proposed transactions: S Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) p 3, https://www.ussc.gov/sites/default/files/pdf/training/annual-national-training-seminar/2018/Emerging_Tech_Bitcoin_Crypto.pdf.

53 S Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) pp 1 to 3, https://www.ussc.gov/sites/default/files/pdf/training/annual-national-training-seminar/2018/Emerging_Tech_Bitcoin_Crypto.pdf.

54 This is known as a "fork".

longest). The computing power required to do this would be enormous, and beyond the capabilities of any single node.[55]

2.27 Once a bitcoin transaction is recorded on the ledger, it cannot, for practical purposes, be amended. The immutability of transactions recorded on the Bitcoin blockchain ensures that no participant can "double spend" a bitcoin. Any attempt to double spend a bitcoin would be contradicted by the ledger (which would contain an immutable record of the previous spend), and the proposed transaction would be rejected by the nodes as invalid.[56]

How do smart legal contracts use DLT?

2.28 In recent years, DLT has become more sophisticated, to the point where computer programs can be recorded on a distributed ledger and performed by the computers on the network. An example of a DLT system that permits this is the Ethereum network. Like the Bitcoin network, the Ethereum network utilises a distributed ledger which records data. However, unlike the Bitcoin network, the Ethereum network enables both transactions and computer programs to be recorded on the ledger. [57] These computer programs are performed automatically by the computers on the Ethereum network when the conditions for their performance are satisfied.[58]

2.29 Smart legal contracts can be deployed on a distributed ledger so that contractual obligations expressed in computer code are performed automatically by the computers on the network. Performance of a smart legal contract is "guaranteed" in the sense that human intervention is not required to facilitate performance.

---

55 S Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) p 3, https://www.ussc.gov/sites/default/files/pdf/training/annual-national-training-seminar/2018/Emerging_Tech_Bitcoin_Crypto.pdf; World Bank, *Distributed Ledger Technology and Blockchain* (2017) p 18, https://olc.worldbank.org/system/files/122140-WP-PUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf; P de Filippi and A Wright, *Blockchain and the Law: The Rule of Code* (2018) p 25.

56 S Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008) pp 1 to 2 https://www.ussc.gov/sites/default/files/pdf/training/annual-national-training-seminar/2018/Emerging_Tech_Bitcoin_Crypto.pdf; P de Filippi and A Wright, *Blockchain and the Law: The Rule of Code* (2018) p 26.

57 A smart (legal) contract can be stored on-chain or off-chain. In relation to the former, the bytecode (an intermediate level of code) of the smart (legal) contract is stored in a transaction that takes place on-chain. In this way, immutability is guaranteed but it is possible for someone to use a decompiler to revert the bytecode back into the original programming language. In relation to the latter, the smart (legal) contract is stored off-chain, with only the hash being recorded on-chain. This ensures both immutability and secrecy of data, but could lead to difficulties in recovering the original smart (legal) contract if it is modified. See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 25.

58 A couple of thousand smart contracts are created on the Ethereum network daily. In May 2021, for example, over 45 million transactions were conducted by the smart contracts deployed on the network. See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 19.

Should the paper be limited to DLT?

2.30 In the call for evidence, we asked consultees if they agreed that the paper should be limited to smart legal contracts which use DLT.[59] We also asked consultees to provide details of other technologies which are used to support smart legal contracts, and their prevalence. Of the 23 consultees who answered this question:

(1) 16 (expressly or implicitly) said that the analysis should not be limited to DLT; and

(2) seven (expressly or implicitly) said that the analysis should be limited to DLT.

2.31 The majority of consultees said that the analysis should be technology neutral. The main reasons provided were that, while smart legal contracts can be deployed on DLT systems, they need not be. In addition, given the nascent state of the technology, it would be unduly restrictive to limit the analysis to smart legal contracts that rely on DLT only. Eversheds Sutherland said to do so would be somewhat "artificial". The Law Society of England and Wales made the point that adopting a "more general" definition of smart legal contracts would "future proof" any legal analysis. Professor Hugh Beale said that "the same problems about wholly automated performance can arise when DLT is not employed".

2.32 After considering consultee responses on this point, we have revised our approach and no longer consider DLT to be an essential feature of smart legal contracts. Limiting the definition to DLT is unnecessarily restrictive.

2.33 Although we have decided to adopt a technology neutral definition of smart legal contracts in this paper, DLT systems have distinctive features and benefits which justify a considered analysis. Consultees who were in favour of restricting the analysis to DLT emphasised the benefits of DLT systems. Dr Sara Hourani and Hendrik Puschmann (joint response) referred in particular to "party anonymity", and Cuneyt Eti referred to the fact that DLT systems do not generally rely on a single party for their execution. Even though we do not definitionally restrict smart legal contracts to those deployed on a DLT system, we refer to DLT in the examples provided to draw out the novel issues to which the technology gives rise.

Permissioned and permissionless DLT systems

2.34 DLT systems can be permissioned or permissionless, and private or public.[60] We understand that the permissioned/permissionless distinction typically relates to the role of participants within the DLT system, whereas the private/public distinction typically refers to access to the system.[61] A permissioned DLT system is generally

---

59 Call for evidence, question 2 at para 2.26.

60 Some sources use the terms "private and permissioned" and "public and permissionless" interchangeably. See, for example, P de Filippi and A Wright, *Blockchain and the Law: The Rule of Code* (2018) pp 31 to 32.

61 World Bank, *Distributed Ledger Technology and Blockchain* (2017) pp 12 to 13, https://olc.worldbank.org/system/files/122140-WP-PUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf. See also T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 12 where a distinction is made between public and private, and permissionless and permissioned blockchains. Public blockchains

one in which authorisation to perform a particular activity on the DLT system is required.[62] Not all participants may have the same rights within the system. Some participants may be granted permission to propose transactions, others to both propose and validate transactions, and some might only be allowed to view transactions on the ledger.[63] In a permissioned structure, participation in the consensus mechanism may be limited to a subset of participants. The ledger can be updated upon the agreement of a specified majority of validator nodes.[64]

2.35 Permissioned systems tend to be private,[65] meaning that the DLT system is only accessible for use by a limited group of participants.[66] Generally, there is a central administrator who admits participants to the network based on specific onboarding criteria, and who enforces the rules of the system.[67] However, in contrast to a centralised entity in a traditional ledger, the role of an administrator in a DLT system is somewhat more circumscribed.[68]

2.36 In a permissionless system, no such authorisation to perform activities on the DLT system is required. The ledger is maintained collectively by the network participants. Data is only added to the ledger when the network participants reach consensus on the validity of the proposed data entry.[69] Permissionless DLT systems tend to be public,[70] meaning that the DLT system is accessible for use by the public.

2.37 In the call for evidence, we asked consultees when and why parties to a smart legal contract might decide to use a permissioned or permissionless DLT system.[71]

---

are described as those where "anyone can see the information and use the system"; private blockchains are described as those where "only chosen users may see the information and use the blockchain". In addition, permissioned blockchains are described as those where "only certain users may become validators", whereas permissionless blockchains are said to be those where "anyone may become a validator".

62 International Organisation for Standardisation, *Blockchain and distributed ledger technologies – vocabularies* (ISO 22739:2020), https://www.iso.org/obp/ui/#iso:std:iso:22739:ed-1:v1:en.

63 World Bank, *Distributed Ledger Technology and Blockchain* (2017) p 13, https://olc.worldbank.org/system/files/122140-WP-PUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf.

64 Bank for International Settlements, BIS Working Papers No 924, *Permissioned distributed ledgers and the governance of money* (January 2021) p 2, https://www.bis.org/publ/work924.pdf.

65 Although permissioned DLT systems tend to be private, they need not be. Ripple is said to be an example of a public DLT system with certain permissioning aspects. See World Bank, *Distributed Ledger Technology and Blockchain* (2017) p 13, https://olc.worldbank.org/system/files/122140-WP-PUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf.

66 International Organisation for Standardisation, *Blockchain and distributed ledger technologies – vocabularies* (ISO 22739:2020), https://www.iso.org/obp/ui/#iso:std:iso:22739:ed-1:v1:en.

67 World Bank, *Distributed Ledger Technology and Blockchain* (2017) p 16, https://olc.worldbank.org/system/files/122140-WP-PUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-.Notes.pdf.

68 World Bank, *Distributed Ledger Technology and Blockchain* (2017) p 16, https://olc.worldbank.org/system/files/122140-WP-PUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf.

69 For example, the "proof of work" consensus mechanism described in para 2.25.

70 An example of a permissionless, public DLT system is the Bitcoin blockchain and Ethereum.

71 Call for evidence, question 3 at para 2.29.

Permissioned DLT systems

2.38 Parties choose to use permissioned DLT systems where it is necessary to maintain a degree of oversight and control over access to the system, data privacy and confidentiality of data. Trakti Ltd said that permissioned DLT systems are used among "industry-level enterprises and businesses, for which privacy and security is relevant", and where "access to data" has to be restricted. Herbert Smith Freehills said such systems are likely to be used where the technical ability to override performance of the code is appropriate. DLA Piper UK said that the features of permissioned DLT systems mean that such systems are typically more suitable for smart legal contracts entered into by "large corporate and financial institutions". Eversheds Sutherland said permissioned systems are utilised in highly regulated industries, where the security of the blockchain and the individual participants is crucial.

2.39 Trakti Ltd said that permissioned systems also enable parties to customise their own system (including selecting an appropriate consensus mechanism) based on individual requirements. D2 Legal Technology echoed our view expressed in the call for evidence that, since identities of participants are generally known, parties can rely on consensus mechanisms that are less computationally intensive,[72] which in turn can lead to increased efficiency and scalability.

2.40 Several consultees provided the example of a permissioned system in the supply chain context. A supply chain is the process by which goods or services are supplied from a producer to a consumer. Supply chains involve many different organisations, and are often reliant on paper-based documentation which makes them inefficient, costly and error-prone. DLT-based smart legal contracts can be used to make supply chains more efficient. A distributed ledger could be used to provide secure, accessible digital copies of documents (such as letters of credits and bills of lading) to relevant parties in the supply chain. 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.[73]

2.41 In the example provided by Eversheds Sutherland, they explained that access to the supply chain blockchain is restricted to certain participants, and the role of the individual participants within the network is limited in terms of what they can see and do. They explained that participants may also be competitors who are subject to competition laws and regulations. Given this, and the many other parties involved in the process (such as brokers, insurers, banks and customs officials), they said that "the security of the data being processed and the identity of the entities and the transactions taking place is therefore absolutely fundamental".

Permissionless DLT systems

2.42 In a permissionless system, no single participant can stop or reverse performance of a smart legal contract, and all participants can generally see transactions on the ledger.

---

72 Call for evidence, para 2.21. For example, some permissioned DLT systems use a "proof of stake" consensus mechanism, where transactions can be validated by a subset of nodes who hold a "stake" in the transaction: P de Filippi and A Wright, *Blockchain and the Law: The Rule of Code* (2018) p 57, n 90.

73 P Sangha, V Pureswaran and S Soman, *Advancing global trade with blockchain* (2020), https://www.ibm.com/downloads/cas/WVDE0MXG.

In addition, it is usually not possible to know the identity of the transacting parties as they use pseudonyms. The Digital Law Association said that permissionless systems are generally used where there is "systemic mistrust" among participants; Stephan Smoktunowicz said such systems are generally used where transparency between users is necessary. Herbert Smith Freehills said a permissionless system is appropriate where the smart legal contract in question will carry out "routine operations" with "little or no negotiation", as well as 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).

2.43 Herbert Smith Freehills mentioned the exchange of digital assets (or digital assets for currency) as an example of transactions that are suited to a permissionless system. By way of example, the Digital Law Association explained that a wallet containing bitcoin can be identified by the address, and the balance can be verified against the state of the ledger. They explained that, in a transaction to transfer the bitcoin to another party on the DLT network, there is no need prove that the owner of the wallet is the owner as "this is verified, in theory, by knowledge of the private key". Similarly, there is no need to know the value of the wallet as this is discernible from the ledger. The system is designed in such a way that there is no need for trust between the participants.

Spectrum of permissioned and permissionless DLT systems

2.44 The reasons consultees provided as to why parties might choose to structure their smart legal contract using a permissioned or permissionless DLT system were in line with those expressed in the call for evidence.[74] However, as Linklaters pointed out, it is important to bear in mind that "there is not a binary distinction between permissioned and permissionless systems, but rather various degrees and types of permissioning to consider". It may be possible to incorporate permissioned elements into otherwise permissionless or public DLT systems, making them more attractive options for the deployment of smart legal contracts.

Variations of existing technologies that can be used to support smart legal contracts

2.45 The Law Society of England and Wales mentioned IOTA, and the technology deployed by Guardtime, as examples of technologies that can be used to support smart legal contracts. They said that "IOTA claims to have fundamentally reengineered what one would regard as distributed ledger technology". We understand from publicly available information that IOTA may in fact be a form of DLT, albeit a distributed ledger that utilises a new technology called the "Tangle" (a stream of individual transactions entangled together) rather than a blockchain.[75] We understand that the Tangle is a data structure based on directed acyclic graph ("DAG") technology. [76] As such, it is said to have no blocks, no chains and also no

---

74 Call for evidence, para 2.27.

75 IOTA, "What is IOTA?", https://iota-news.com/about-iota/.

76 IOTA, "What is IOTA?", https://iota-news.com/about-iota/.

miners.[77] The release of the IOTA Smart Contracts Protocol Alpha is said to permit developers to take advantage of a DAG-based distributed ledger for smart contracts, and to design the environment according to the user's specific requirements.[78]

2.46 The Law Society of England and Wales said that the technology developed by Guardtime, which we understand to be Keyless Signature Infrastructure ("KIS"),[79] "is the precursor of blockchain technology". They said this technology differs from DLT or blockchain,[80] in that it deploys a "third party publishing mechanism" instead of a "consensus mechanism to ensure the integrity of the ledger". In other words, Guardtime's technology "does not rely on any consensus mechanism for the deployment of smart contracts".

2.47 According to the Law Society of England and Wales, technologies to support smart legal contracts will "continue to develop in view of the significant scalability and cost challenges presented by current consensus-based blockchain technology". The suggestion that other technologies may be developed to support smart legal contracts reinforces the conclusion that the definition of a smart legal contract should be technology neutral.

ORACLES

2.48 An oracle is an external data source which transmits information to a computer program. In the call for evidence, we gave various examples of situations in which oracles might be used. For example, we referred to a travel insurance policy in the form of a smart legal contract, linked to a global air traffic database relaying flight data to the computer program.[81] As soon as a flight is delayed, that information is relayed to the computer program by the oracle, triggering an automatic payment by the computer program to the policy holder. Oracles could also be used to relay information, such as interest rate movements, which impact the performance and payment obligations under a derivative contract. The relay of this information would trigger the automatic performance of these obligations without the need for human intervention.[82]

2.49 Three consultees drew attention to the so-called "oracle problem", that is, the problem of ensuring that external data sources provide accurate, reliable and timely data to the

---

77 IOTA, "What is IOTA?", https://iota-news.com/about-iota/.

78 IOTA, "IOTA Smart Contracts Protocol Alpha Release" (4 March 2021), https://blog.iota.org/iota-smart-contracts-protocol-alpha-release/.

79 Guardtime, "About Guardtime", https://guardtime.com/about.

80 Some sources refer to KSI as a form of DLT, and as a form of blockchain technology. In relation to the former, see Government Office for Science, *Distributed Ledger Technology: beyond block chain* (2016) p 6, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf#page=17. In relation to the latter, see Centre for Technology & Global Affairs, *Blockchains for Governmental Services: Design Principles, Applications and Case Studies* (December 2017) p 8, https://www.ctga.ox.ac.uk/sites/default/files/ctga/documents/media/wp7_martinovickellosluganovic.pdf.

81 Call for evidence, para 2.10.

82 Call for evidence, para 2.51, referring to P de Filippi and A Wright, *Blockchain and the Law: The Rule of Code* (2018) p 95.

smart legal contract so that it executes in a way intended by the parties.[83] The Chancery Bar Association and Commercial Bar Association (joint response) said that the reliance of smart legal contracts on oracles may entail the "shifting of trust to oracles or arbitrators who are brought in to resolve disputes", rather than entirely removing the need for trust. In their view, the "regulation" of oracles and other intermediaries will be an important issue. D2 Legal Technology envisaged addressing the "oracle problem" through the contractual relationship between the parties to the smart legal contract, and the oracle service provider. Dr Robert Herian said that the "oracle problem" remains a "major obstacle for smart contract design and implementation".

2.50 Smart legal contracts and associated technologies require parties to consider a broader range of factors before contracting than they would otherwise consider before concluding a traditional contract, including the use and regulation of oracles. Parties would be well advised to allocate risk in relation to, and to provide for, a malfunctioning oracle or inaccurate data inputs in their smart legal contract.

THE FORMS A SMART LEGAL CONTRACT CAN TAKE

2.51 The form a smart legal contract takes will depend on (amongst other things) the smart contract platform, the parties' requirements, and the relevant use case. Although smart legal contracts can take a variety of forms with varying degrees of automation, it is helpful (for the purpose of the legal analysis) to consider three broadly-defined forms.

(1) A natural language contract in which some or all of the contractual obligations are performed automatically by the code of a computer program. The code itself does not define any contractual obligations, but is merely a tool employed by one or both of the parties to perform those obligations. This type of smart legal contract can also be referred to as an "external" contract, as the code falls outside the scope of the parties' legally binding agreement.[84]

(2) A hybrid contract in which some contractual obligations are defined in natural language, and others are defined in the code of a computer program.[85] Some or all of the contractual obligations are performed automatically by the code. At one end of the spectrum, the terms of a hybrid contract could be primarily written in code with a few natural language terms setting out, for example, the governing law and jurisdiction. At the other end of the spectrum, the terms of a hybrid contract could be primarily written in natural language, and include just one or two terms written in code. In addition, the same contractual term(s) can be written in both natural language and in code. The natural language terms

---

83 See also T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 28, where the "oracle problem" is described as a situation whereby only a single source is used to relay information to an oracle, thereby creating a "single point of failure and requiring trust in just one entry point".

84 This terminology is adopted by the UKJT in its consultation paper: see UK Jurisdiction Taskforce, Consultation paper*: The status of cryptoassets, distributed ledger technology and smart contracts under English private law* (2019) p 31.

85 This kind of agreement is sometimes referred to as a "Ricardian contract". In this paper, we use the term "hybrid contract".

can be incorporated in an accompanying natural language agreement, or in natural language comments included in the code.

In his response to the call for evidence, Nicholas Bohm said that since source code can contain non-executable comments "consisting of human readable text", such comments "could of course be used to express contractual language". However, he said that such comments are more frequently "used to explain the workings of the 'operational' part of the code". In our view, parties can choose to include contractual terms by way of natural language comments in the code, although it may be preferable to incorporate such terms in a separate, natural language agreement. Whether or not such comments do constitute contractual terms will be a matter of contractual interpretation and construction.[86] To avoid any uncertainty or ambiguity, parties would be well advised to make clear the status of any comments in code, and whether or not such comments form part of the parties' contract.

(3) A contract in which all of the contractual terms are defined in, and performed automatically by, the code of a computer program. No natural language version of the agreement exists.

2.52 Even though one can classify a smart legal contract according to one of the three forms set out above, it may not always be necessary (or indeed possible) to do so; the form may vary from obligation to obligation. For example, an individual obligation within a smart legal contract may be a hybrid obligation if it is defined in both natural language and in code. In the same smart legal contract, another obligation may be defined solely in code. Classification of a smart legal contract, or indeed of the individual obligations within the contract (while helpful for the purposes of the legal analysis) should not be approached too rigidly or prescriptively.

Differentiating between the various forms of smart legal contract

2.53 All three forms of smart legal contract involve the use of computer code. What distinguishes the three forms is the role played by the code. In the first form of smart legal contract, the code's role is limited to performing obligations which are defined in the natural language contract. In contrast, in the second and third forms, the code is used to define contractual obligations, as well as to perform them. The Digital Law Association said that ascertaining where the "boundaries of the legally enforceable agreement are drawn between the natural language and code" is an important consideration.

2.54 Even though the majority of consultees expressly or implicitly agreed that code can define contractual terms, this approach was not universally endorsed. For example, Nicholas Bohm made the point that "a contract defines and imposes rights, powers, privileges and immunities", whereas "code just performs actions". Despite this view, we agree with the conclusions reached in the UKJT Legal Statement that a smart legal contact can include terms which are both defined in, and performed by, code.[87] However, whether the code in question "just performs actions", or whether it contains

---

86 We discuss interpretation in Chapter 4 and, in particular, comments in the source code from para 4.75.

87 See UKJT Legal Statement at [144].

contractual terms, will depend on the role played by the code. This, in turn, is a question of interpretation and contractual construction.[88]

Considerations before entering into a smart legal contract

2.55 The practical steps involved in concluding a smart legal contract are likely to differ in certain respects from those involved in concluding a traditional contract. Identifying when an agreement is reached and how it is recorded will be a matter of fact in each case. We expect that parties will, in many cases, engage in natural language negotiations with a view to reaching an agreement on the terms of their bargain. At some point, the parties will take steps to procure a piece of code which defines or performs some or all of those contractual obligations.

2.56 In his response to the call for evidence, Stephan Smoktunowicz suggested that parties should ask themselves a series of questions before entering into a smart legal contract, including the following.

(1) What obligations do the parties wish to automate, and what is the relationship between those obligations and any non-coded terms?

(2) What is the translation process involved in coding a natural language obligation?

(3) If some terms are defined in natural language and some in code, what hierarchy applies in the event of a conflict?

(4) Where does liability lie if the code fails, there is a security breach or data is comprised?[89]

(5) What is the dispute resolution process, bearing in mind cross-border elements and local laws?[90]

2.57 The questions set out above serve as a useful starting point for parties who wish to conclude a smart legal contract. The LawTech Sounding Board also made the point that it is crucial that parties "conduct a rigorous planning phase" before drafting a smart legal contract. They emphasised that "collaboration between lawyers and coders is key"; parties should be clear as to what the goals and business requirements are.

2.58 Throughout this paper, we identify particular issues which we think parties could usefully consider and address in the terms of their smart legal contract. We include a short, non-exhaustive list of these issues in Appendix 3. Dealing directly with these issues in contractual terms should reduce uncertainties regarding the legal treatment of the parties' smart legal contract, and reduce the scope for potential disputes.

---

88 We discuss this in more detail in Chapter 4 (Interpretation) from para 4.13.

89 We discuss this in more detail in Chapter 5 (Remedies).

90 We discuss this in more detail in Chapter 7 (Jurisdiction and smart legal contracts).

The role played by third party service providers in concluding a smart legal contract

2.59 In the call for evidence, we asked consultees to provide examples of the role played by third party service providers (such as computer coders and software firms) in the negotiation, drafting and entering into of a smart legal contract.[91]

2.60 Many consultees emphasised the importance of coders in the formation of a smart legal contract. The parties may contract with a computer coder to draft the code based on instructions provided jointly to the computer coder by the parties. The Law Society of England and Wales said that these instructions may take the form of a business requirements document, setting out the details of the transaction, and what the parties intend the code to do. Herbert Smith Freehills said:

> As smart contracts are reliant on the operation of code, appropriately skilled technicians must play a pivotal role in the negotiation, drafting and ongoing maintenance 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.

2.61 MBM Commercial also mentioned that there is scope for "an in-house coding team" to assist parties in drafting and entering into smart legal contracts. As an alternative, Herbert Smith Freehills said that "parties may use (or have their legal advisers use) off-the-shelf contract-neutral tools which may require little or no coding skills". Peter Howes provided examples of other third parties involved in the creation of a smart legal contract, such as system integrators, software developers and software providers, all of whom assist in designing and implementing the smart contract platform.

Natural language contract with automated performance

Process involved in negotiating, drafting and entering into a natural language contract with automated performance

2.62 In the call for evidence, we asked consultees what process parties follow in negotiating, drafting and entering into a smart legal contract. We asked consultees to explain, in particular, the practical steps involved in coding the parties' rights and obligations where all the contractual obligations are contained in a natural language agreement, and the code is intended merely to perform those obligations.[92]

2.63 Consultees said that the process involved in negotiating, drafting and concluding a natural language contract with automated performance is likely to be the same as with traditional contracts. However, they emphasised that parties will need to give due consideration, early on in the process, to the elements that are to be automated. The nature of the natural language obligation will determine whether or not it is suitable for coding.

---

91 Call for evidence, question 6 at para 2.41.

92 Call for evidence, question 6 at para 2.41.

Examples of natural language contracts with automated performance

2.64 We asked consultees which of the three forms of smart legal contract are most commonly used in existing use cases, or in use cases currently in development.[93] We also asked consultees to provide examples of how these forms of smart legal contract have been used in practice. Of the 22 consultees who answered this question, 11 said natural language contracts with automated performance are most commonly used in practice. However, some consultees, including Vodafone, expressed the view that the use of hybrid and solely code smart legal contracts may increase in the future. For example, Vodafone said that "there may be a shift more into hybrid, or code contracts" as the uptake of smart legal contracts and the associated technology increases.

2.65 Eversheds Sutherland described a permissioned, supply chain system as an example of a natural language agreement with automated performance. In this case, "contract terms are deliberately outside the smart contract elements". The code automates certain obligations contained in the natural language agreement, such as the triggering of "an automatic notification to the buyer's bank for release of funds to the seller" once the conditions set out on the agreement have been met.

2.66 Catherine Phillips pointed to the work of the International Swaps and Derivatives Association ("ISDA") in this area. ISDA have noted that "derivatives are fertile territory for the application of smart contracts and DLT because their main payments and deliveries are heavily dependent on conditional logic".[94] While the ISDA Master Agreement and schedule are concluded in natural language, elements of the agreement that define the payment and delivery obligations can be "re-written in a more formal representation" (such as a high level programming language). This "more formal representation" is ultimately readable and processable by computers, thereby enabling the automation of certain elements of the natural language agreement.[95]

Hybrid smart legal contract

Process involved in negotiating, drafting and entering into a hybrid smart legal contract

2.67 In the call for evidence, we asked consultees what practical steps are involved in drafting, negotiating and agreeing the code of a hybrid smart legal contract. In addition, we also asked consultees to identify whether the natural language element and the coded element are entered into contemporaneously or at different times.[96]

---

93 Call for evidence, question 4 at para 2.39. Consultees generally did not provide examples of smart legal contracts currently in development, although it is possible consultees answered this in their responses to question 7 (current and future use cases of smart legal contracts).

94 ISDA, *Smart Contracts and Distributed Ledger – A Legal Perspective* (2017) p 19, https://lpscdn.linklaters.com/-/media/files/linklaters/pdf/mkt/london/smart_contracts_and_distributed_ledger_a_legal_perspective.ashx?rev=0546d49d-236c-43dd-8944-456f797715ca&extension=pdf&hash=C8AC6A99BA668E447AE0408817EE5843.

95 ISDA, *Smart Contracts and Distributed Ledger – A Legal Perspective* (2017) p 19, https://lpscdn.linklaters.com/-/media/files/linklaters/pdf/mkt/london/smart_contracts_and_distributed_ledger_a_legal_perspective.ashx?rev=0546d49d-236c-43dd-8944-456f797715ca&extension=pdf&hash=C8AC6A99BA668E447AE0408817EE5843.

96 Call for evidence, question 6 at para 2.41.

2.68 Trakti Ltd outlined the process of entering into a hybrid smart legal contract as follows:

> The negotiation takes place in a classic way, no peculiarities are recognised. The contract drafting phase is different. The operational clause that will be implemented by the code must be parameterised. 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.

2.69 Herbert Smith Freehills explained that various "cross-functional teams" will need to work together to map out the natural language obligations and the coded elements of the hybrid agreement "in parallel". For more "bespoke" clauses, they said that "logic flows and process mapping are likely to be a valuable stage in the process towards automation of clauses". They also made the point that parties will need to factor in the time required to code the various elements as part of the contract timeline. In addition, they said that it is important for parties to understand the requirements of the smart legal contract in order to "understand the digital connections and processes with which the automations are intended to interact".

2.70 With regard to the timing of concluding the natural language and coded elements, Herbert Smith Freehills said that they expect these to be finalised at the same time. However, they also said that an alternative approach is for the natural language agreement to include an obligation to finalise and implement the coded terms of the smart legal contract, with the "substantive provisions being conditional upon such finalisation and implementation". With regard to the alternative approach, Herbert Smith Freehills said that concluding the natural language and coded elements at different times "could affect the binding nature of the agreement". They explained that, even if the agreement includes an obligation to finalise the coded terms, there is a risk "that the agreement to implement the coded parts would be unenforceable as an 'agreement to agree'". An "agreement to agree" is an agreement under which the parties promise one another to enter into a further agreement at some future time.[97] In general, agreements to agree are unenforceable because they lack the necessary certainty required for a legally binding contract.[98]

Interaction between natural language and code in hybrid smart legal contracts

2.71 In the call for evidence, we asked consultees how natural language and code interact in hybrid smart legal contracts, and which terms are generally coded.[99] Consultees said that the nature and degree of the interaction between natural language and code in a hybrid smart legal contract varies depending on (amongst others) the intention and sophistication of the parties, and the smart contract platform. Herbert Smith Freehills said that "there is not a one size fits all approach".

---

97 An "agreement to agree" was described in argument in *Watford v Miles* [1992] 2 AC 128, 131, as "an agreement to enter into a concluded agreement".

98 *Watford v Miles* [1992] 2 AC 128, 138, by Lord Acknew.

99 Call for evidence, question 5 at para 2.40.

2.72 Code and natural language can also interact without the contract constituting a hybrid smart legal contract. For example, computer code can include natural language text or comments to help document and explain the workings of the code, without the comments constituting contractual terms.[100]

2.73 Herbert Smith Freehills pointed out that natural language and code in hybrid smart legal contracts should interact appropriately at both a "legal level" and at a "technical level". At the "legal level", they said that parties should make clear what the relationship is between the natural language and coded terms, whether the code forms part of the parties' legally binding agreement, and the consequences if the code does not perform as the parties intend. At the "technical level", the smart legal contract should be supported by a sufficiently developed and robust smart contract platform, which would "enable each smart contract hosted on it to be fully recorded and to have its performance appropriately managed and executed".

Unified and non-unified approach to drafting coded terms in a hybrid smart legal contract

2.74 Herbert Smith Freehills distinguished between a "unified" and "non-unified" approach to drafting hybrid smart legal contracts.[101] In the "unified" approach, the code is said to be a "direct representation of the logic and variables of the natural language provision". The same obligation is expressed in both natural language and in code. In relation to the "non-unified" approach, "the automation expressed in code instructions does not necessarily need to mirror the entire logic of the natural language term". Such an approach to drafting coded terms is said to provide the parties with additional flexibility in terms of automation.

2.75 In the call for evidence, we defined a hybrid smart legal contract as a smart legal contract, some terms of which are defined in natural language, and other terms of which are defined in code. However, we agree with Herbert Smith Freehills and the Digital Law Association that it is possible for the same term to be expressed in both natural language and in code. Where there is an overlap between the natural language and coded terms, parties would be well advised to stipulate which of the two expressions of the term is the primary one, or which takes precedence in the event of a conflict.

Examples of hybrid smart legal contracts

2.76 Seven consultees said that hybrid contracts were most commonly used in practice, although very few consultees provided examples of their use. Alfonso Delgado mentioned the example of parties who wish to engage in algorithmic trading. He said that, in this case, the parties can enter into a natural language, master agreement, which serves as an "umbrella contract" containing "provisions of general applicability". The master agreement would govern the individual trades placed on the trading platform, but the individual parameters and terms of those trades can be defined in the code. The natural language agreement would make clear that the terms of the individual trades placed on the platform formed part of the same agreement. It should be noted that, even though this example can constitute a hybrid smart legal contract, it

---

[100] We discuss comments in code from para 2.7 and at para 2.51(2), and in Chapter 4 from para 4.75.

[101] The Digital Law Association referred to the "unified" and "paired" method of drafting hybrid smart legal contracts.

can also constitute a natural language agreement with automated performance if the parameters of the individual trades are defined in the natural language agreement, and executed by the code.[102]

2.77 Trakti Ltd mentioned the generic use of hybrid smart legal contracts in the "enterprise market", where "the parameters and the code are combined together in [a] clear and compliant way that is human readable and transparent".

Solely code smart legal contract

Process involved in negotiating, drafting and entering into a solely code smart legal contract

2.78 In the call for evidence, we asked consultees what practical steps are involved in drafting, negotiating and agreeing the code of a solely code smart legal contract.[103] In relation to the steps taken prior to coding, the Law Society of England and Wales said that:

> 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.

They further explained that once the coder has drafted the code, "it is common to utilise (typically third party) code verifiers or auditors" to ensure that the code reflects the intentions of the parties.[104] This was said to be particularly relevant where automation serves a business-critical need.

2.79 Although in some cases a smart legal contract will be negotiated and agreed upon between two or more parties, this may not always be the case. For example, one party could develop the solely code smart legal contract and deploy it on a platform (such as Ethereum) for other participants to interact with.[105] In these instances, there is unlikely to be bespoke negotiation between the parties.

Examples of solely code smart legal contracts

2.80 Four consultees said solely code contracts were most commonly used in practice. Dr Robert Herian and Alfonso Delgado provided the example of a crowdfunding arrangement and an initial coin offering. An initial coin offering (or "ICO") is generally the sale of a cryptoasset by an issuer to a purchaser. Consultees provided more detail about the process. Alfonso Delgado said that:

> 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

---

102 This was the view adopted in the UKJT Legal Statement at [143]. A master agreement in terms of which individual trades are executed on a blockchain was said to be the "archetypal" example of a natural language agreement with automated performance.

103 Call for evidence, question 6 at para 2.41.

104 See also Tech London Advocates, *Blockchain: Legal & Regulatory Guidance* (2020) p 37.

105 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 45 where reference is made to the creation of a "smart contract factory", which consists of "templates of code". These templates could relate to the smart (legal) contract in its entirety, or to specific clauses.

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.

2.81 The Society of Trust and Estate Practitioners (STEP) explained that the investor can make an offer to buy the cryptoasset by connecting a "crypto wallet" to the relevant system, and describing how much of the cryptoasset they wish to buy. If this offer is accepted by the issuer, the transaction takes place on the system without the need for human intervention.

2.82 In addition, we were told by Trakti Ltd that solely code contracts are commonly used in the cryptocurrency market, where the smart legal contract performs basic tasks such as "automatically moving an amount of cryptocurrency from one party's wallet to another when certain criteria are satisfied".

Solely code smart legal contracts are likely to be rare in practice

2.83 Professor Hugh Beale said that solely code smart legal contracts are likely to be "very rare" in practice, and "probably limited to experimental interactions between coders". He said that "every serious transaction is going to have a purpose that nearly all parties will formulate with words".

2.84 In relation to the prevalence of solely code smart legal contracts, Allen & Overy made the point that:

> For the foreseeable future in a commercial context, we expect [solely code] 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.

2.85 Even though solely code smart legal contracts may not be as frequently encountered in practice as natural language agreements with automated performance, or hybrid contracts, we think it is useful to retain the analysis of solely code contracts in this paper. First, including such contracts within the scope of the paper ensures a complete analysis, and accords with the position adopted in the UKJT Legal Statement, which contemplates obligations being defined solely by the code.[106] Second, these types of smart legal contracts give rise to novel legal issues in the context of contract formation and remedies and, as Vodafone said, their prevalence might increase over time as the underlying technology becomes progressively sophisticated.

USE CASES FOR SMART LEGAL CONTRACTS

2.86 In the call for evidence, we identified various use cases for smart legal contracts.[107] These included insurance, finance, decentralised finance, real estate, supply chain, peer to peer and intellectual property use cases. In the call for evidence, we asked consultees to provide additional (or varied) examples of use cases which were either

---

106 UKJT Legal Statement at [142].

107 Call for evidence, paras 2.43 to 2.63.

being developed, were at the proof of concept stage or which were already operational. We asked consultees to include a description of the underlying technology, the role played (if any) by oracles, and the contractual terms (if any) performed automatically by the computer program. We also asked whether the smart legal contract was a business to business contract, a peer to peer contract or a business to consumer contract.[108]

2.87 Below we describe some of the additional use cases identified by consultees. We have prepared these descriptions based on the responses we received from consultees and publicly available information. We are not directly familiar with the products.

Decentralised finance ("DeFi")

2.88 DeFi (sometimes known as "open finance") is an umbrella term referring to a wide range of financial activity usually deployed on DLT systems such as the Ethereum network. While the traditional finance system runs on centralised infrastructure managed by central authorities such as banks and other intermediaries, DeFi allows users to interact directly. Proponents of DeFi identify it as an opportunity to introduce novel forms of finance, and to remove intermediaries from cryptoasset transactions, loans, crowdfunding and betting.

2.89 Herbert Smith Freehills identified Aave, "a decentralised finance platform allowing users to lend and borrow digital assets". They explained that "deposited funds are allocated in a smart contract". The code for the contract is "public and open source", and "formally verified by third party auditors". We understand from publicly available information that, in order to use the service, users simply deposit their preferred asset and amount. After depositing, users can earn passive income based on the market supply and demand. Additionally, depositing assets allows users to borrow funds by using their deposited assets as collateral. Any interest users earn by depositing funds helps offset the interest rate they accumulate by borrowing.[109]

2.90 Herbert Smith Freehills further explained that the protocol allows "anyone to interact with the user interface client, API or directly with the smart contract on the Ethereum blockchain". They also said that the smart contract uses a price oracle, and that if a user interacts with the smart contract directly on the blockchain, all contractual terms are automated. If, however, the "user interacts with the smart contract via Aave's website, an additional agreement in natural language governs the relationship between the user and Aave's website". This use case is said to be an example of a peer to peer smart legal contract, although Herbert Smith Freehills made the point that, depending on the facts, this solution can also support smart contracts which are not smart legal contracts.

Service level agreement monitoring

2.91 Trakti Ltd provided the example of a use case involving the automatic monitoring of service level agreements. They explained that the smart legal contract is designed to "monitor the execution of a cloud IT service with agreed [Key Performance Indicators]

---

[108] Call for evidence, question 7 at para 2.64.

[109] Introduction to Aave, "FAQ", https://docs.aave.com/faq/.

and parametric prices". It assigns "a penalty for low performances, the agreed fee in case of agreed performances or a bonus in case of higher performances". The smart legal contract (which we understand is, at the time of writing, being worked on) is said to run on the Ethereum network. Trakti Ltd explained that "oracles are used to collect measures of the IT service from a [Key Performance Indicator] dashboard". They said that the increase or decrease in the fee is directly linked to the change "between the weighted average of all the measures collected in a billing cycle and the agreed target in the contract". The smart legal contract is said to automatically terminate where performance is lower than "30% of the agreed target". This use case is said to be an example of a business to business smart legal contract.

Real estate transactions

2.92 The Digital Law Association referred to Propy, a tech company based in Silicon Valley whose "core product is a residential real estate transaction platform, powered by smart contracts". We understand from publicly available information that a vendor can list a property for sale and a buyer can make an offer to purchase the property. The website explains that, if the offer is accepted, Propy automatically generates the sale and purchase agreement.[110] Once all parties have electronically signed the agreement, the purchase agreement is encrypted and recorded on the blockchain. Once all the relevant documentation has been uploaded, the buyer is said to have fiat and cryptocurrency options to pay the purchase price. The website further explains that when the buyer makes payment, Propy records the payment as received on the smart contract.[111] Finally, the buyer receives the officially recorded deed with the blockchain address on it. The Digital Law Association explained that, currently, the blockchain only "mirrors official land registry records". However, they said that the platform's long-term goal is to be adopted as an "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".

Parametric insurance

2.93 Parametric insurance is a type of insurance where the insurer promises to pay a specified sum upon the occurrence of a triggering event, usually without the insured party having to demonstrate or quantify their loss. As parametric insurance contracts contain a conditional obligation (to pay a sum of money on the occurrence of an event) they are arguably good candidates for automation by computer programs.

2.94 Herbert Smith Freehills noted that, in 2019, "the law firm Clyde & Co launched a connected parametric insurance contract through its smart contract consultancy, Clyde Code". They explained that the "smart contract provides cover to a solar energy producer against the risk of shortfall in expected energy generation due to unfavourable weather conditions". We were told that the contract "was built in collaboration with the smart legal contract platform Clause", although "it can be deployed on other systems and platforms". The parametric insurance contract, which we understand to be available to the market, "consists of a data model, a logic code,

---

110 Propy, "What is Propy? How does Propy work?" (April 2019), https://propy.com/browse/what-is-propy-how-does-propy-work/.

111 Propy, "What is Propy? How does Propy work?" (April 2019), https://propy.com/browse/what-is-propy-how-does-propy-work/.

and a supporting natural language contract". Herbert Smith Freehills explained that "the contract operates by receiving weather data from external sources". They said that it "automates the pay-out from the insurance policy by receiving weather data, calculating potential claims, and producing an exportable report on insurance premiums or losses". This use case is said to be an example of a business to consumer smart legal contract.

2.95 Herbert Smith Freehills provided an additional example of a parametric insurance use case by the name of Arbol, which "utilises smart contracts deployed on the Ethereum blockchain". They said that Arbol is a platform covering businesses in the "agriculture, energy, maritime and hospitality industries against climate risks", making "event-based outcome payments without intermediaries". Herbert Smith Freehills further explained that oracles are used to "provide data from the National Oceanic and Atmospheric Administration", as well as from other sources. They said that a user "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". This use case is said to be an example of a business to consumer smart legal contract.

Aviation refuelling

2.96 Herbert Smith Freehills described a use case developed by S7 Airlines, Alfa bank and Gazpromneft-Aero involving a "blockchain-based, smart contract to refuel an aircraft". They said that the technology is aimed at facilitating the "quicker settlement of accounts", and minimising the "financial risks by removing the need for prepayment or bank guarantees". Herbert Smith Freehills explained that when the pilot requests the agreed volume of fuel from the operator, the airline's bank receives an order, and reserves funds on the airline's account. The bank sends an instant confirmation, which enables the refuelling to start. They further explained that funds are then debited from the airline's account once the refuelling is complete, and accounting documents are exchanged between the parties. We were told that the "smart contract [is] deployed on a private, Ethereum protocol based blockchain". It is said to automate payment terms and generate accounting documents in digital form. This use case is said to be an example of a business to business smart legal contract.

Other use cases for smart contracts

2.97 In its response to the call for evidence, STEP discussed several other use cases for smart contracts (in the sense of self-executing code), other than the creation of legally binding contracts.

2.98 STEP suggested that smart contracts could be used to transfer assets upon, or in contemplation of, death. For example, Alice may deploy a smart contract which is programmed, upon being notified of her death, to transfer an asset to Bob. STEP said it was aware that fintech companies are considering how smart contracts can be used in this context. These smart contracts, in STEP's view, could potentially be analysed as wills or codicils, or as gifts made in contemplation of death. However, in our view, there may be several legal barriers to the use of smart contracts in this context. For example, a will or codicil must be capable of change or revocation before the testator dies.[112] A will or codicil in the form of a smart contract may have difficulty satisfying

[112] Making a Will (2017) Law Commission Consultation Paper No 231, para 11.1.

this requirement, to the extent that the smart contract code is deployed on an immutable ledger, or other smart contract platform that does not have the technical capabilities to permit amendment to, or withdrawal of, the code. In addition, a will or codicil in the form of a smart contract would face difficulties with regard to fulfilling the necessary requirements for attestation.

2.99 It is also possible that a smart contract designed to distribute assets after a person's death may conflict with a will or intestacy rules. For example, if Alice dies leaving a will that passes all of her cryptocurrency to Bob, Bob is entitled to the cryptocurrency that Alice holds at the time of her death. It is difficult to see how a smart contract designed by Alice to, for example, transfer her cryptocurrency to Cath on Alice's death can affect Bob's entitlement; the smart contract would (in effect) be a codicil that is void for non-compliance with the relevant formalities.

2.100 Gifts made in contemplation of, and conditional upon, the death of the donor are known as donatio mortis causa.[113] The use of smart contracts to make such gifts (or donationes) may be constrained by the requirement that the donor must "deliver dominion" (possession) over the subject matter of the gift to the donee.[114] It is not clear how a smart contract could satisfy this requirement if it is programmed only to transfer the asset upon death, unless the deployment of the smart contract could itself be considered a form of constructive delivery of the asset. In this regard, we do not think that deploying a smart contract would constitute delivery of the asset. In general, something must be delivered to the recipient of the gift – whether that is the thing itself, a means of accessing the thing, or a document evidencing entitlement to possession. Deployment of the code does not satisfy these requirements.

2.101 STEP also suggested that smart contracts could be used to create trusts. For example, Alice may deploy a smart contract which is programmed to transfer 10 Ether to Bob if Bob is living on his 21st birthday, or else to Carol. The smart contract, in STEP's view, could potentially amount to a trust. The 10 Ether would be the trust property, and the smart contract code could be drafted so as to satisfy the other certainties required for the creation of a trust. However, utilising smart contracts to create trusts can give rise to difficulties. In the first instance, as STEP pointed out, complications may arise in identifying a trustee of the trust: "possibly Alice might be considered a trustee, if she is still alive, or else the Court might exercise its jurisdiction to appoint a trustee". However, even if a trustee could be identified, we agree with STEP that the trustee may not be able to exercise control over the trust property if the smart contract is self-executing.

2.102 We acknowledge that smart contract technology could potentially be used to give effect to other legal arrangements, such as wills or trusts. However, these legal arrangements (and the issues to which they give rise) are outside the scope of this project, which is concerned with the use of smart contract technology to create legally binding contracts. Formalities relating to wills are dealt with under the Wills Act 1837, and are being addressed in the Law Commission's project on Making a Will.[115] Our

---

113 Making a Will (2017) Law Commission Consultation Paper No 231, para 13.1.

114 *King v Dubrey* [2015] EWCA Civ 581, [2016] Ch 221 at [50] by Jackson LJ.

115 Making a Will (2017) Law Commission Consultation Paper No 231. For current status updates see the project page at www.lawcom.gov.uk/project/wills/.

Consultation Paper in that project does not specifically consider smart contract technology, but we provisionally propose the introduction of an enabling power to enable electronic wills, and that the enabling power should be neutral as to the form that electronic will takes.

COSTS AND BENEFITS OF SMART LEGAL CONTRACTS

2.103 In the call for evidence, we identified several benefits and cost savings associated with the use of smart legal contracts.[116] These included increased efficiency and lower transaction costs, lower enforcement costs, and reduced risk of fraud. We considered that these benefits and cost savings were attributable, at least in part, to the use of DLT. We asked consultees what benefits and cost savings smart legal contracts could provide compared to traditional contracts. We also asked consultees if the increased use of smart legal contracts would lead to additional costs, and to provide qualitative and quantitative evidence where possible.[117]

2.104 Consultees generally agreed with the benefits and cost savings of smart legal contracts that we identified in the call for evidence. Almost all consultees emphasised the potential for smart legal contracts to enhance efficiency, provide greater transparency, and reduce enforcement costs. Consultees also pointed out that the extent to which upfront, development costs will be outweighed by cost savings during the lifecycle of the contract will become clearer as the prevalence of smart legal contracts increases.

Benefits of smart legal contracts

Efficiency

2.105 Almost all consultees said that smart legal contracts may increase efficiency and lower transaction costs because they can be performed automatically without the need for human intervention. Herbert Smith Freehills said that smart legal contracts may reduce the number of human errors, reduce the amount of labour required to manage a contract, and increase the speed of contractual performance. The Digital Law Association said that smart legal contracts may dramatically reduce the time taken to complete procedurally complex transactions involving multiple stages. However, the Digital Law Association also noted that "clear and quantifiable smart contract efficiency data is difficult to find".

2.106 The Society of Licensed Conveyancers said that they could not comment on the potential benefits and cost savings "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".

Transparency

2.107 Several consultees said that smart legal contracts provide increased transparency to the contracting parties compared to traditional contracts. Stephan Smoktunowicz said that smart legal contracts can provide the parties with "a single central store of information/documentation", reducing the need for parties to exchange and reconcile

---

116 Call for evidence, para 2.65.

117 Call for evidence, question 8 at para 2.66. Qualitative and quantitative evidence was generally not provided.

information. Eversheds Sutherland also said that smart legal contracts could deliver "increased visibility" to parties in complex supply chains.

Reduced enforcement costs

2.108 Consultees identified reduced enforcement costs as a key benefit of smart legal contracts. If properly coded, a smart legal contract is simply unable to refuse to act, to omit a condition, or to fail to perform so long as the requisite conditions are met. Consultees, including Transpact and Dr Robert Herian, predicted that enforcement action for failure to perform obligations under a contract may therefore be less common in relation to smart legal contracts as compared to traditional contracts.[118] Transpact said:

> 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 mechanisms to enforce, which can break down or not occur. Whereas the smart contract is itself the enforcement mechanism.

2.109 D2 Legal Technology also commented that smart legal contracts reduce "performance risk", as they make it more difficult for a counterparty to "engage in opportunistic behaviour" by breaching the contract.

Additional costs of smart legal contracts

The cost of creating a smart legal contract

2.110 The majority of consultees highlighted the potentially significant costs involved in creating a smart legal contract compared to a traditional contract. The LawTech Sounding Board pointed out that such costs include building a smart contract platform, paying coders to write the coded element of the smart legal contract, and testing the smart legal contract before deployment. Similarly, Eversheds Sutherland commented that, like any new solution, smart legal contracts will require an "upfront investment in technology". Vodafone also referred to the costs involved in "developing, programming and implementing the smart contract". By contrast, Catherine Phillips noted that if parties use a "ready-made contract platform (such as Ethereum or Hyperledger Fabric)", the time needed to prepare and draft a smart legal contract could be "reduced to minutes".

2.111 The Digital Law Association commented that the costs of creating a smart legal contract are likely to be higher in the short-term, where the "platforms, skills and precedents are less developed". However, the development of "pre-formatted articles in both natural language and computer code" could dramatically reduce the cost of creating a smart legal contract over time. Similarly, D2 Legal Technology said that the development of "model clauses" may reduce the cost of drafting smart legal contracts.[119] Katherine Graff also commented that costs are likely to fall over time as

---

118 It is unlikely that claims for breach of contract or restitution will be eliminated entirely in a smart legal contract context. We discuss this in more detail in Chapter 5 (Remedies).

119 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 45 where reference is made to the creation of

the smart contract process becomes more standardised, and lawyers become more adept at coding.

2.112 Consultees also noted that parties to a smart legal contract may need to obtain insurance, at additional cost, to cover errors made by coders and system operators.

Costs of enforcement

2.113 Stephan Smoktunowicz commented that resolving disputes under a smart legal contract may be more costly than in the case of traditional contracts. He said this was because expert evidence is likely to be required to enable the court, arbitral tribunal or other dispute resolution body to understand the coded element of the smart legal contract. The cost of obtaining such expert evidence may be "prohibitive" for some parties. However, he noted that these costs may be expected to diminish over time as judges and arbitrators become more familiar with the language of code, and smart legal contract technology. Herbert Smith Freehills also commented that smart legal contracts may lead to "new types of disputes", which could lead to additional costs.

Environmental costs

2.114 It is often said that mining activities on DLT systems have a disproportionate environmental impact in terms of the energy they consume, and the generation of electronic waste. The energy consumption of a particular network will depend on its consensus mechanism. For example, and as we have also discussed elsewhere,[120] the high energy consumption of the Bitcoin network is a design feature of that network, which uses proof of work as its consensus mechanism. Other consensus mechanisms may reduce energy consumption by orders of magnitude.[121] Indeed, the Ethereum Foundation identified a need to change from a proof-of-work consensus mechanism to verification by proof-of-stake, which is generally considered to reduce power consumption of the network by two orders of magnitude.[122] This is particularly significant given the Ethereum network's role as the first platform for smart contracts. As smart contracts begin to be used more frequently, the consumption of the network will necessarily increase.

2.115 In their response to the call for evidence, the Chancery Bar Association and Commercial Bar Association (joint response) said:

> 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.

2.116 The Digital Law Association pointed out that:

"templates of code" covering specific clauses, and which can be used in the creation of smart (legal) contracts.

120 Electronic Trade Documents (2021) Law Commission Consultation Paper No 254, from para 7.79.

121 J Sedlmeir, HU Buhl, G Fridgen and R Keller, "The Energy Consumption of Blockchain Technology: Beyond Myth" (2020) 62(6) *Business and Information Systems Engineering* 599.

122 See, for example, P Fairley, "Ethereum Plans to Cut Its Absurd Energy Consumption by 99 Percent" (2 January 2019), https://spectrum.ieee.org/ethereum-plans-to-cut-its-absurd-energy-consumption-by-99-percent.

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.

2.117 These concerns regarding energy consumption and attendant carbon emissions from DLT must be viewed against the background of Government's legal obligations under the Climate Change Act 2008. The 2008 Act imposes an overall emissions reduction target,[123] as well as requiring the Government to establish carbon budgets for the UK.[124] The tension between DLT and these carbon budgets could be a significant difficulty in the coming decades if DLT becomes the underlying framework for smart legal contracts without the intensity of its energy consumption being addressed.

[123] Climate Change Act 2008, s 1.

[124] Climate Change Act 2008, s 4. See also *R (Friends of the Earth Ltd and others) v Heathrow Airport Ltd* [2020] UKSC 52, [2021] 2 All ER 967.

Chapter 3: Formation of smart legal contracts

3.1 In this chapter, we discuss the formation of smart legal contracts. We begin by outlining the requirements for a legally binding contract under the law of England and Wales. We then discuss how these requirements might be satisfied in the context of smart legal contracts. In relation to each requirement, we set out our views as to whether the current law is appropriate to accommodate smart legal contracting, or whether reform or additional consideration of the law may be required. We conclude that smart contracts can constitute legally binding contracts under the law of England and Wales, although additional complexities arise in relation to deeds, which are subject to additional formality requirements. In this regard, we do not consider that parties can be confident that the current law supports the creation of deeds which are wholly or partly defined by code.

THE LAW ON CONTRACT FORMATION

3.2 Under the law of England and Wales, there are several requirements for the formation of a legally binding contract. These are:

(1) agreement;

(2) consideration;

(3) certainty and completeness;

(4) intention to create legal relations; and

(5) formality requirements.

3.3 We discuss each of these requirements below, and set out our conclusions on how the law in each area may be applied to smart legal contracts. In doing so, we incorporate consultees' responses to the questions raised in the call for evidence.

AGREEMENT

3.4 A contract requires an agreement, comprising an offer and an acceptance. An offer is an expression of willingness to be bound by specified terms when it is accepted by the person to whom it is made.[125] An acceptance is a final and unqualified expression of assent to the terms of an offer.[126] Whether there is an offer and acceptance is determined objectively, based on the parties' words and conduct.[127] In some cases, it

---

125 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 4-003; see also *Air Transworld Ltd v Bombardier Inc* [2012] EWHC 243 (Comm), [2012] 1 Lloyd's Rep 349 at [75] by Cooke J.

126 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 4-031; see also *Air Transworld Ltd v Bombardier Inc* [2012] EWHC 243 (Comm), [2012] 1 Lloyd's Rep 349 at [79] by Cooke J.

127 *RTS Flexible Systems Ltd v Molkerei Alois Müller GmbH* [2010] UKSC 14, [2010] 1 WLR 753 at [45] by Lord Clarke.

may not be necessary to identify an offer and acceptance.[128] For example, where the parties have signed a contractual document containing the agreed terms, there is unlikely to be any dispute about whether the parties have reached an agreement.[129]

3.5 As we explain in Chapter 2, we have identified three broad forms of smart legal contract: a natural language agreement that is performed by code, a hybrid agreement where terms are defined in natural language and in code, and a solely code agreement, where all contractual terms are defined in code.[130]

3.6 We do not anticipate that the courts in this jurisdiction will encounter difficulties in determining whether an agreement has in fact been reached in relation to the first or second type of smart legal contract. For these types of smart legal contract, we expect that the parties would ordinarily have engaged in natural language negotiations or other communications. In such cases, the task for the court will be to determine whether an agreement has in fact been reached as a result of those natural language communications. This is a task with which the courts of England and Wales are well familiar. Where the parties' natural language communications have culminated in a signed, natural language document containing contractual terms, there is unlikely to be any dispute about whether the parties have reached an agreement.

3.7 However, novel questions may arise in relation to solely code smart legal contracts, particularly where the parties have engaged in limited or no natural language negotiations or communications. We have identified two particular scenarios which may pose novel legal questions in relation to agreement in this context. The first scenario concerns the situation where the parties enter into a transaction on a DLT system or other smart contract platform by deploying and interacting with the code, without engaging in natural language negotiations or communications. The issue here is whether the parties can be considered, by their conduct in deploying and interacting with the code, to have reached an agreement. The second scenario concerns the situation where the parties deploy computer programs (for example, on a distributed ledger), and those programs subsequently interact and execute transactions. The issue here is whether the parties can be held to be legally bound by the operation of the programs deployed by them. We consider each of these scenarios in turn below.

Agreement by conduct on a DLT or other smart contract platform

3.8 It is conceivable that parties may transact with one another on a DLT system or other smart contract platform by deploying and interacting with the code, without engaging in natural language communications. In principle, it is possible for parties to reach an agreement in this way. As the Chancery Bar Association and Commercial Bar Association (joint response) said:

> 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

---

128 *New Zealand Shipping Co Ltd v AM Satterthwaite & Co Ltd* [1975] AC 154, 167, by Lord Wilberforce (noting that it may be artificial in some cases to engage in an offer and acceptance analysis).

129 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 53.

130 We discuss the three forms of smart legal contract in more detail from para 2.51.

implication of the fact of the deployment), that is capable of amounting to an offer and acceptance.

3.9 Consultees generally agreed with this.[131] Catherine Phillips said that DLT systems "lend themselves to unilateral contracts, which can be accepted by conduct". The Digital Law Association also commented that public blockchains "can technically replicate existing processes for reaching an agreement".

3.10 Consider the following example:[132]

> Suppose Alice decides to deploy a computer program on Ethereum, the code of which provides that if 10 Ether is sent to the program, the program will transfer a token to the account from which the Ether was sent. Bob, who is code-literate, stumbles across Alice's program, reads the source code, and decides to interact with the program. Bob sends 10 Ether to the program, and the program automatically executes, transferring the token to his account.

3.11 The conduct of Alice and Bob in this example may give rise to an agreement.[133] In the first instance, Alice's act of deploying the computer program on the DLT system can be considered an offer. This is because the computer program deployed by Alice will automatically transfer a token on the receipt of 10 Ether. Once the Ether is received, there is no scope for further negotiation between Alice and the buyer, suggesting that Alice's objective intention is to make an offer.

3.12 However, circumstances can be envisaged where the deployment of the program by Alice is merely an invitation to treat rather than an offer. An invitation to treat is not an expression of a willingness to be bound by certain terms, but merely an invitation to negotiate.[134] For example, Alice might deploy the program subject to certain conditions, such as the satisfactory completion of anti-money laundering and "know your customer" checks. In these circumstances, the correct analysis may be that Alice's intention is only to invite offers from other users on the platform, which she can then accept or reject depending on whether the conditions are satisfied.[135]

3.13 Support for the proposition that the deployment of a computer program can amount to a contractual offer can be found in *Thornton v Shoe Lane Parking* ("*Thornton"*).[136] In that case, the defendant installed a machine in its car park, which would automatically grant entry to the car park when money was inserted into the machine. Lord Denning

---

131 We asked consultees to tell us about the ways in which parties can reach agreement through their interactions on a distributed ledger: call for evidence, question 9 at para 3.13.

132 We also used this example in the call for evidence, at para 3.6.

133 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 32 for a similar view, and where the point is made that "despite being technically unilateral, the smart contract can be legally binding".

134 See *Fisher v Bell* [1961] 1 QB 394; *Pharmaceutical Society of Great Britain v Boots Cash Chemists (Southern) Ltd* [1953] 1 QB 401, 802.

135 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 33 for a similar view, and where the point is made that deployment of the code does not constitute an offer if the deployment is merely an "invitation to negotiate".

136 [1971] 2 QB 163 ("*Thornton*").

MR explained that the defendant, in holding out the machine as being ready to receive money, was making an offer to customers to use the car park in exchange for payment.[137] The same reasoning could apply in the smart legal contract context: a person who deploys a piece of code on a smart contract platform which automatically transfers an asset in the event of payment could be considered to be making an offer.

3.14 Lord Denning MR continued to find that agreement was reached "at the very moment when [the customer] put his money into the machine";[138] this was the acceptance. Equally, Bob's conduct in sending 10 Ether to the program could be considered an acceptance of Alice's offer. Just as the insertion of money into the machine in *Thornton* was considered to be an acceptance, the sending of money to the computer program by Bob could also be considered an acceptance. The law of England and Wales generally requires an acceptance to be "communicated" to the offeror.[139] However, in a unilateral contract, where a party makes a promise to do something if someone else performs a specified act, performing the act is sufficient for acceptance.[140] Accordingly, Bob could accept Alice's offer by sending the Ether to Alice's computer program (thereby "calling" or triggering the smart legal contract), without having to provide a separate communication of his acceptance.[141]

Additional evidence may be required to evidence an agreement in more complex scenarios

3.15 In principle, therefore, it is possible for parties to reach an agreement on a DLT system by deploying and interacting with the code, without engaging in natural language negotiations or communications. The relevant question is whether deployment of the code amounts to an offer, and interaction with the code amounts to an acceptance. If it does, then an agreement can be said to be reached without more. These are questions which the courts of England and Wales are able to resolve in the ordinary way, by asking what the parties objectively intended by the deployment of and interaction with the code. Although the circumstances of smart legal contracting may be novel, "the analysis that is in principle required will remain the same".[142] We do not consider that the legal principles in this area need to be revised to accommodate the formation of agreements on DLT systems or other smart contract platforms.

3.16 Whether the particular deployment and interaction with the code constitutes an agreement depends on the facts. For example, in some circumstances, the particular

---

137 *Thornton*, 169.

138 *Thornton*, 169.

139 The reason being that it may be unfair to hold the offeror bound before they know the offer has been accepted: H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 4-055; see *Entores Ltd v Miles Far East Corporation* [1955] 2 QB 327, 333, by Denning LJ; *Holwell Securities v Hughes* [1974] 1 WLR 155, 157, by Russell LJ.

140 H Beale (ed), Chitty on Contracts (34th ed 2021) para 4-059; *Carlill v Carbolic Smoke Ball Co* [1893] 1 QB 356; *Harvela Investments Ltd v Royal Trust of Canada (CI) Ltd* [1986] AC 207, 224, by Lord Diplock; *Soulsbury v Soulsbury* [2007] EWCA Civ 969, [2008] Fam Law 13 at [50] by Longmore LJ; *Air Transworld Ltd v Bombardier Inc* [2012] EWHC 243 (Comm), [2012] 1 Lloyd's Rep 349 at [79] by Cooke J.

141 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 33 for a similar view, and where the point is made that "the calling of smart contracts" should be considered as "proof that consents have been exchanged".

142 UKJT Legal Statement at [146].

deployment and interaction with the code will clearly not amount to an offer and acceptance (for example, in a test environment).[143] In other cases, where (for example) multiple participants are involved in complex multilateral transactions, ascertaining whether the particular interaction with the code in question amounts to an offer and acceptance (and therefore to an agreement) may be less straightforward. As Linklaters said:

> 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.

3.17 In these cases, additional evidence may be required to support the conclusion that an agreement has been reached (for example, detailed rulebooks or rules of the system which set out how an agreement is formed). Similarly, the Digital Law Association said that the question of whether an agreement has been reached, and between whom, is likely to depend on the "technical or legal rules" of the DLT system. They commented that, in many cases, the users of a DLT system will not be code literate, and will interact with one another via an app, website or other user interface operated by a third party. The addition of a user interface between the transacting parties may introduce "complicating factors" into the analysis of whether an agreement has been reached and, if so, between whom.

3.18 To overcome any difficulties in determining whether an agreement has been reached by deployment and interaction with the code in more complex arrangements, parties may wish to consider making use of sophisticated smart contract platforms, which (as Herbert Smith Freehills said) "will support parties in reaching legal agreements in the same way that they currently do".

Agreements made between pseudonymous parties

3.19 Parties who transact with one another on a DLT system or other smart contract platform may do so using pseudonyms.[144] For example, on the Bitcoin network, each user has a public or wallet address (much like an email address) from which the user can initiate transactions. The public address linked to a particular transaction is known, but the identity of the user linked to that public address is unknown. Users who transact on the system may therefore be unaware of the real identity of the party with whom they are dealing. There is no requirement under the law of England and Wales for the parties to a contract to know each other's real identities.[145]

---

143 UKJT Legal Statement at [147].

144 In the call for evidence, we asked how common this is: call for evidence, question 12 at para 3.25.

145 H Beale (ed), Chitty on Contracts (34th ed 2021) para 5-037, which makes the point that "the identity of the person with whom one is contracting or proposing to contract is often immaterial"; UKJT Legal Statement at

3.20 Both Florian Idelberger and Cuneyt Eti said that it is common for buyers and sellers on decentralised exchanges to be unaware of each other's real identities. Similarly, the Digital Law Association said that "most order-book based digital currency exchanges do not reveal any identifying data, nor the wallet addresses, of the counterparties to a trade".

3.21 However, an agreement reached between parties unknown to one another may give rise to difficulties in practice. Herbert Smith Freehills made the point that, practically speaking, it may be very difficult for a party to seek and enforce a remedy against a counterparty whose identity is unknown.[146] They said that commercial parties would be well advised to use a smart contract platform that integrates "mechanisms for verification of party identity", such as a permissioned DLT system. Similarly, the Digital Law Association said that identity verification is likely to be a "prerequisite" for the use of smart legal contracts by commercial parties. Commercial parties are likely to use smart contract platforms with "sophisticated permissioning, identification and authorisation". D2 Legal Technology also commented that, as smart legal contracts become more widely used, there will be a "drive" towards the use of private and permissioned DLT systems. We expect that identity verification is likely to be a key feature of smart contract platforms which are developed for mainstream commercial use. In practice, we think it is unlikely that commercial parties will enter into smart legal contracts without being aware of the identity of their counterparty.

3.22 Several consultees commented on the evidence that could be used to establish the identity of a party to a transaction on a public or permissionless DLT system.[147] Herbert Smith Freehills said that it may be possible to combine a user's public address with "other public information such as previous transaction data and IP addresses to produce evidence of a party's identity". They also said that it may be possible for a court to order a platform operator, cryptocurrency exchange or other intermediary to provide transaction and other data which might link a transaction to a particular party. Several consultees noted that platforms which are subject to anti-money laundering and "know your customer" requirements are required to verify the identities of participants. Accordingly, it may be easier to ascertain the identity of the transacting parties on these platforms.

Incapacity

3.23 Under the law of England and Wales, certain categories of persons lack capacity to enter into legally binding agreements. These include persons who are under the age of 18 (minors), persons who lack mental capacity, and persons who are incapacitated by intoxication.[148] Where a minor enters into a contract, the general rule is that the

---

[156] (referring to sales at auctions to the highest bidder, unilateral contracts as in *Thornton*, and agents contracting on behalf of an undisclosed principal as examples of contracts in which the real identity of at least one of the parties is unknown).

146 But see *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 where the High Court granted a proprietary injunction over bitcoin contained in a cryptoasset exchange account, even though the identity of the account holder was unknown.

147 We asked about this in the call for evidence, question 13 at para 3.26.

148 Mental Capacity Act 2005, ss 2 and 3. The Mental Capacity Act 2005 was enacted following a recommendation by the Law Commission that there should be a single comprehensive legislation making

contract is voidable (that is, liable to be set aside) by the minor.[149] Where a person who lacks mental capacity or is intoxicated enters into a contract, the contract is voidable by that person, provided the other party to the contract knew or ought to have known of that person's lack of mental capacity or intoxication.[150]

3.24 Several consultees commented on the issue of capacity in the context of smart legal contracts. These consultees said that DLT systems may have limited means to verify capacity, and that it may be more difficult to protect the interests of parties who lack capacity, given that smart legal contracts perform automatically. D2 Legal Technology said that public DLT systems "do not check for legal capacity" and that "anyone can open an account even if they would be regarded at law to not have sufficient legal capacity to do so". Luminita Procopie commented on the "danger" of minors and other persons who lack capacity entering into transactions on DLT systems. The Chancery Bar Association and Commercial Bar Association (joint response) said that it may be necessary to impose legal limitations on who may have access to a private key or who may sign a transaction on a DLT system, in order to safeguard the interests of parties who lack capacity.

3.25 We recognise that there is a potential risk that parties who transact on DLT systems may lack the capacity to enter into legally binding agreements. As these transactions are entered into at a distance, and in some cases pseudonymously, a party may have no means of checking the capacity of their counterparty. This risk is not, however, unique to smart legal contracts; it also arises when parties enter into agreements online. Parties who offer smart legal contracts in certain industries will be required to comply with the laws and regulations applicable to that industry. For example, where parties are required to comply with "know your customer" requirements, we think the issue around capacity (while not removed) may be reduced, as identity verification would be a prerequisite to accessing the particular services. However, outside of these areas, capacity may present a greater issue. In addition, the automaticity of smart legal contracts may make it more difficult, as a practical matter, to unwind the performance of a smart legal contract that is voidable by reason of a party's incapacity. We discuss the topic of unwinding voidable smart legal contracts in more detail in Chapter 5 of this paper.

Computer programs reaching agreement

3.26 Consider the case where Alice and Bob each deploy computer programs on a distributed ledger, and those computer programs subsequently interact with one another, leading to a transaction between Alice and Bob. In such a case, the question

---

provision for persons who lack mental capacity: see Mental Incapacity (1995) Law Com No 231. See also A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020), p 223, which explains that a person lacks mental capacity if, at the time of entering into the contract, they are unable to make the decision for themselves to enter into the contract because of an impairment of, or a disturbance in the function of, the mind or brain. It appears that the same test of incapacity has been applied where incapacity by reason of intoxication is alleged: H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 11-106.

149 The exception being for contracts for "necessaries" and contracts of apprenticeship, education and service: H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 11-008.

150 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 223; *Imperial Loan Co Ltd* [1892] 1 QB 599, 601; *Dunhill v Burgin* [2014] UKSC 18, [2014] 1 WLR 933, 943.

arises as to when (if at all) the parties could be found to have reached an agreement as a result of the operation of the computer programs deployed by them.

3.27 The process of offer and acceptance itself can be undertaken automatically by computer programs, whether on a DLT or non-DLT system, without the need for human intervention.[151] This view is supported by consultees.[152] The Chancery Bar Association and Commercial Bar Association (joint response) said:

> 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 … . 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.

3.28 Professor Kelvin FK Low said that the "law of contract is sufficiently broad and general to encompass numerous modes of contracting", including the use of computer programs. Similarly, Professor Hugh Beale said that "if the two sets of code are programmed to enter a transaction when certain conditions occur and those [conditions] do occur", there should not in principle be any difficulty in concluding that an agreement has been reached.

3.29 The legal support for this proposition comes from two cases in particular: the decision of the High Court of England and Wales in *R (Software Solutions Partners Ltd) v HM Customs & Excise* ("*Software Solutions"*),[153] and the decision of the Singapore Court of Appeal in *Quoine Pte Ltd v B2C2 Ltd ("Quoine")*.[154]

3.30 *Software Solutions* concerned a piece of software which automatically generated contractual offers of insurance. The software was programmed so that, when an insurance broker inputted customer details into the software, the software would automatically generate an offer of insurance on behalf of an insurer if its "qualification criteria" were met. The insurance broker could then accept the automatically generated offer on behalf of the customer, leading to the formation of an insurance contract. The judge in *Software Solutions*, Kenneth Parker QC (as he then was), observed that there was no reason in principle why a contractual offer could not be automated by a computer program.[155] Just as the defendant in *Thornton* made a binding offer by holding out an automatic ticket machine as being ready to receive money, the insurers in *Software Solutions* made an offer by holding out the software as an "automatic medium for contract formation".[156]

---

151 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 33 for a similar view, and where the point is made that "the automated exchange of consents" should be recognised as "contractually valid".

152 Almost all consultees considered that the process of offer and acceptance can be automated by computer programs deployed by the parties. We asked about this in the call for evidence, question 11 at para 3.20.

153 [2007] EWHC 971 (Admin) ("*Software Solutions*").

154 [2020] SGCA(I) 02 ("*Quoine*").

155 *Software Solutions* at [65] and [67].

156 *Software Solutions* at [67].

3.31 *Software Solutions* was a case where the offer was automatically generated by the computer program, while the acceptance remained a matter for human intervention. The decision of the Singapore Court of Appeal in *Quoine* suggests that both offer and acceptance can be automated by computer programs, so that the entire process of reaching an agreement occurs without human intervention. In this case, the parties each deployed computer programs on a cryptocurrency exchange platform. The programs were programmed to place orders to buy and sell cryptocurrency on the platform at algorithmically determined prices. Subsequently, one party's program placed an offer to sell cryptocurrency, and the other party's program automatically accepted that offer, leading to an exchange of cryptocurrency. The Singapore Court of Appeal, citing *Thornton* and *Software Solutions*, held that the operation of the parties' programs gave rise to a legally binding contract for the sale of cryptocurrency.[157] The parties in *Quoine* held out their programs as a mechanism for reaching agreement, and were bound by the agreements that were in fact entered into by those programs.[158]

3.32 Parties already use computer programs to enter into agreements on non-DLT platforms (for example, on cryptocurrency exchanges and algorithmic trading platforms). Allen & Overy said that "rules-based software systems" are sometimes used by parties to enter into trades with other market participants. They said that it would be "contrary to market expectation and potentially disruptive" if an agreement could not be reached in this way. Similarly, Florian Idelberger commented that, in the context of high frequency trading, "automated offer and acceptance happens all the time". He also made the point 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.

In our view, there is no reason why the analysis should be any different when parties deploy computer programs on a DLT system, even though parties may choose to deploy such programs on a "separate machine", as Florian Idelberger pointed out.

When is a computer program "held out" for the purposes of contract formation?

3.33 The key question in determining if the parties have reached an agreement by the operation of computer programs deployed by them is whether the parties can be said to have "held out" their computer programs for the purposes of reaching an agreement. Slaughter and May said that the "holding out" of a computer program for the purposes of reaching an agreement may be demonstrated by the operation of the computer program itself:

> 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*),

---

157 *Quoine* at [93] to [96].

158 *Quoine* at [96].

> or pricing algorithms might be used to determine whether a computer programme should buy or sell cryptocurrency (as with *Quoine*).

3.34 Other consultees said that it would be necessary to consider the circumstances in which the computer programs were deployed, including any prior agreements or understandings between the parties. Linklaters said that the existence of an agreement based on the interaction of computer programs was likely to depend on whether there was "clear evidence" as to the basis on which the programs were deployed. Allen & Overy said that it would be necessary to consider the context, including the relevant market, as well as any "general understanding communicated between the parties" about the use of the computer programs.

3.35 Ultimately, whether the parties have held out their computer programs in this way is a question of fact which turns on various factors. It may be evident from a separate natural language agreement or understanding between the parties that the programs were deployed for the purposes of reaching an agreement. In addition, the nature of the platform on which the programs are deployed, any terms and conditions governing the use of the platform, and the operation of the computer programs themselves are all relevant considerations. If it cannot be proven that the parties' computer programs were "held out" for the purposes of reaching an agreement, no agreement can be said to have been formed on this basis. This is because where a computer program has not been held out for the purposes of reaching an agreement, the operation of that program in making or accepting an offer cannot be considered a manifestation of that party's intention to be bound by the agreement.

An alternative view

3.36 In contrast to other consultees, Clifford Chance doubted whether an agreement can be reached by the autonomous interaction of computer programs deployed by the parties. In their view, the case of *Software Solutions* makes clear that an offer can be made by a computer program, but the law in this jurisdiction is not clear that a computer program can accept an offer:

> 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.

3.37 Clifford Chance said that the current law may lead to the "profoundly uncomfortable" conclusion that computerised and software based transactions might not be capable of having contractual force. This conclusion would be "absolutely contrary to the beliefs and expectations of those engaged in this sort of trading, and cannot be accepted".

3.38 We do not consider that the law in this area leads to this result. If, as *Software Solutions* establishes, a computer program can make an offer, we see no reason why a computer program cannot also accept an offer, as the Singapore Court of Appeal

held in *Quoine*.[159] Where a computer program has been held out by a party for the purposes of reaching an agreement, the operation of that program in making or accepting an offer can be considered a manifestation of that party's intention to be bound by the agreement. In Chapter 5 of this paper, we consider the remedies that might be available where computer programs have behaved in a way that the parties did not intend.

CONSIDERATION

3.39 An agreement cannot be legally binding unless it is supported by consideration. Consideration means a promise or (in the case of a unilateral contract) performance by one party in exchange for a promise by the other party.[160] The consideration requirement means that promises made gratuitously – that is, for nothing in return – are not capable of being legally binding. The exception is a promise made by deed, which does not require consideration to be legally binding.

3.40 Where a smart legal contract takes the form of a natural language agreement which is performed by code, the existence of consideration can be determined in the conventional way. The question would be whether, under the natural language agreement, a promise was made or (in the case of a unilateral contract) performance was provided by one party in exchange for a promise by the other party. The same is likely to be true in the case of a hybrid agreement, to the extent that the natural language element of the agreement sets out the mutual promises made by the parties.

3.41 A potentially novel question arises as to how consideration could be identified where the promises of the parties are defined by the code. Our view is that consideration could be identified by examining the code and its operation. As we put it in the call for evidence:[161]

> If, for example, the code provides that cryptocurrency is to be transferred from Bob to Alice on a certain date, upon which a token is to be transferred from Alice to Bob, this agreement could satisfy the requirement for consideration. The code could be interpreted as expressing a promise by Bob to pay Alice on a certain date, and a promise by Alice to transfer the token to Bob upon payment.

3.42 In our view, the law on consideration does not pose unique barriers to the use of smart legal contracts, even where the terms of the smart legal contract are defined solely by the code. The majority of consultees agreed with this analysis.[162] The Chancery Bar Association and Commercial Bar Association (joint response) said:

> where a [solely code] smart contract results in fully executed promises from both sides occurring simultaneously, or immediately after one another, then both sides

---

159 *Quoine* at [96], holding that the trading contracts in that case were formed "when an offer made by one algorithm was accepted by the other".

160 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 8.

161 Call for evidence, para 3.29.

162 We asked consultees if they were aware of, or foresaw, any difficulties in applying the law on consideration to smart legal contracts: call for evidence, question 14 at para 3.30.

have got what they bargained for and it can clearly be stated that there has been good consideration passing from both promisors.

3.43 Herbert Smith Freehills and the Digital Law Association said that where a promise is defined by code, it may be more difficult in some cases to identify the consideration for the promise. These consultees recommended the use of specially developed smart contract platforms which integrate natural language and code, and which record the consideration moving from both parties. We agree that the use of such platforms would be useful in removing the scope for any potential disputes regarding consideration.

CERTAINTY AND COMPLETENESS

3.44 An agreement is not legally binding unless it is certain and complete. An agreement is uncertain if its terms are too vague to be enforceable,[163] and incomplete if the parties have failed to agree on essential matters.[164] The law of England and Wales does not require agreements to be certain or complete in an absolute sense.[165] An agreement will only be found to be uncertain if it is "legally or practically impossible to give to the parties' agreement any sensible content".[166] Indeed, given their essential role in finding solutions, the courts are eager to uphold agreements rather than to strike them down.[167] This position is supported by the fact that mere difficulty in interpreting the agreement, or in identifying its precise terms, does not usually render an agreement unenforceable.[168]

3.45 Where a smart legal contract consists of a natural language agreement which is performed automatically by code, the certainty and completeness of the agreement can be determined in the ordinary way, by examining the terms of the natural language agreement. However, the question arises as to how a court could assess the certainty and completeness of an agreement which is defined wholly or partly by code.

Hybrid agreements

3.46 In a hybrid agreement of natural language and coded terms, the natural language and coded terms may conflict with one another. However, an agreement is not uncertain merely because of a conflict between its terms, provided that the conflict can be resolved in the ordinary course of adjudicating the dispute.[169] Conflicts between the coded and natural language terms of a hybrid smart legal contract would therefore

---

163 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 4-185.

164 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 4-145.

165 *Hillas & Co Ltd v Arcos Ltd* (1932) 1478 LT 503, 514, by Lord Wright; see also *Wells v Devani* [2019] UKSC 4, [2020] AC 129.

166 *Scammell v Dicker* [2005] EWCA Civ 405, [2005] 3 All ER 838 at [30] by Rix LJ.

167 See *Durham Tees Valley Airport Limited v Bmibaby Limited & Anor* [2010] EWCA Civ 485, [2011] 1 All ER 731 at [53] to [55], where the Court favourably quoted Rix LJ in *Scammell v Dicker* [2005] EWCA Civ 405, [2005] 3 All ER 838, and noted the "reluctance to strike down what were obviously intended to be legally enforceable commercial agreements".

168 *Scammell & Nephew Ltd v HC and JG Ouston* [1941] AC 251, 268, by Lord Wright.

169 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 4-191.

principally be resolved through a process of interpretation by the court, as would be the case in a traditional contract. A court will only hold an agreement to be uncertain, and therefore unenforceable, as a "last resort".[170] Consultees agreed with this position.[171] Allen & Overy noted:

> 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 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 by applying established principles.

3.47 Similarly, Slaughter and May said that conflicts between natural language and coded terms "can be resolved in the usual manner, via interpretation by the court". Only when it is impossible to resolve the conflict by interpretation will the court hold an agreement to be uncertain. As Lord Justice Rix said in *Scammell v Dicker*:

> Inconsistencies between different parts of a document or several documents making up a contract … are the everyday stuff of contract and of commerce. If the parties cannot resolve such problems, they go to tribunals to find an answer: and the courts should strain to be the preserver and not the destroyer of bargains, especially where, as here, the parties have acted upon their apparent agreement.[172]

3.48 Nevertheless, we consider that parties who enter into hybrid smart legal contracts would be well advised to stipulate whether the natural language or coded terms are to take precedence in the event of a conflict. We consider how the principles of interpretation might be applied to smart legal contracts in Chapter 4 of this paper.

Solely code agreements

3.49 In the case of solely code agreements, we suggested in the call for evidence that the behaviour of the code may be a strong indication as to whether the agreement is certain and complete. We said:

> 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. Accordingly, where a piece of code has been performed by a computer, we consider that there may be little scope to argue that the agreement is uncertain or incomplete.

3.50 However, consultees identified various situations in which solely code agreements could potentially give rise to novel issues of uncertainty or incompleteness.

---

170 *Astor Management AG v Antalaya Mining Plc* [2017] EWHC 425 (Comm), [2018] 1 All ER (Comm) 547 at [64] by Leggatt J, cited with approval in *Openwork Ltd v Forte* [2018] EWCA Civ 783 at [27] by Simon LJ.

171 We asked consultees if they were aware of, or foresaw, any difficulties in determining whether the parties to a smart legal contract have reached a certain and complete agreement: call for evidence, question 15 at para 3.35.

172 [2005] EWCA Civ 405, [2005] 3 All ER 838 at [31].

When the nature of the legal agreement is not clear from the code

3.51 In some circumstances, code may execute to produce a certain result, but the nature of the legal arrangement is not clear from the code or from the result. That is, the transaction executed by the code could be legally characterised in a number of different ways. Linklaters said that, in such a case, the agreement may be uncertain or incomplete.

3.52 They provided the following example:

> 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 … 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.

3.53 Linklaters said that this transaction could be legally characterised in several ways, including as a secured loan, an outright transfer of an asset, a barter, a sale and purchase agreement, or a repurchase agreement. In their view, if the court is unable to determine the nature of the legal relationship between the parties, this may have implications for the certainty and completeness of the agreement. In such a case (so the argument goes) it may be difficult for the court to ascribe a definite meaning to the terms (such as to make the agreement certain), and/or to conclude that all essential terms have been agreed (such as to make the agreement complete). Linklaters said this situation could be contrasted with that of a vending machine:

> 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.

3.54 The Chancery Bar Association and Commercial Bar Association (joint response) envisaged a similar situation, but suggested that the legal effect of code principally raises an issue of interpretation, rather than certainty:

> 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.

3.55 In our view, 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 on the basis that it is not clear what the nature of the legal agreement is.[173] In such a case, we think it may be particularly difficult to argue that the terms cannot be given any sensible content (and are therefore uncertain), or that essential terms are missing (such that the agreement is incomplete). This is particularly so as courts are generally reluctant to strike down agreements, especially where the agreement has been performed or acted upon.[174] In addition, difficulty in ascertaining the effect of the code is not a bar to finding a binding agreement; the latter principally raises issues of interpretation, which the courts are well equipped to deal with. It is only on the rare occasions where it is "legally or practically impossible to give to the parties' agreement any sensible content" that the agreement will be found to be uncertain.[175]

Uncertainty in identifying the terms of a solely code contract

3.56 In the case of a solely code agreement, it may be difficult to identify the code that comprises the agreement. This is because a solely code agreement typically comprises various layers of code deployed on complicated digital infrastructure. The Digital Law Association said:

> 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?

3.57 Similarly, Herbert Smith Freehills commented that there may be a lack of certainty as to where the "boundaries" of the smart legal contract lie, given that the code must go through "multiple layers of technology … before it produces a final result". Again, parties who do define their agreement in code would be well advised to set out in natural language their agreement in relation to the code.

3.58 Ascertaining where the boundaries of the legally enforceable agreement are drawn between the natural language and the code is, in our view, principally a matter of contractual construction, rather than an issue of certainty or completeness.[176]

---

173 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 32 for a similar view, and where the point is made that "certainty" is not particularly problematic in the smart legal contract context because such contracts are "if/then" systems requiring binary rules.

174 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 4-186.

175 *Scammell v Dicker* [2005] EWCA Civ 405, [2005] 3 All ER 838 at [30] by Rix LJ.

176 We discuss this in more detail in Chapter 4 (Interpretation) from para 4.13.

Where the code does not perform as expected

3.59 Several consultees disagreed with our suggestion in the call for evidence that the fact of the code's performance would, in itself, indicate that the code was certain and complete.

3.60 Peter Howes said that a piece of code may still be "valid and executable" even if it omits some instruction that the parties consider essential. Even a piece of code which does contain all essential instructions may still perform in unexpected ways. Accordingly, the fact that a piece of code has executed does not necessarily mean that the code is certain and complete.

3.61 Similarly, Transpact said that it is a mistake to treat computer code "as always producing the same results". 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".

3.62 As consultees have noted, the performance of a piece of code cannot always be predicted in advance, or from a reading of the code.[177] However, we do not think that this raises an issue of uncertainty or incompleteness, provided that the agreement is not so vague that no definite meaning can be given to it, and that important matters have been agreed. The performance of a piece of code primarily raises issues as to how the code is to be interpreted, and what remedies might be available to the parties in respect of the code's execution. We discuss these issues in Chapters 4 and 5 of this paper, respectively.

INTENTION TO CREATE LEGAL RELATIONS

3.63 An agreement is not legally binding unless the parties intend to create legal relations: that is, they must intend for their agreement to be legally enforceable. The intention of the parties is determined objectively, by reference to their words and conduct, rather than their subjective states of mind.[178] Where an express agreement is made in a commercial context, an intention to create legal relations is presumed under the law of England and Wales.[179] In contrast, if the agreement is made in a social or familial context, it will be presumed that the parties did not intend to create legal relations.[180]

3.64 Where a smart legal contract takes the form of a natural language agreement which is performed by code, the question of whether the parties intended to create legal relations is conventional. If the agreement is made in a commercial context, it will be presumed that the parties intended to create legal relations. The party denying the legal effect of the agreement will bear the burden of proving that it was not intended to create legal relations. In contrast, if the agreement is made in a social or familial

---

177 We discuss this in more detail in Chapter 4 (Interpretation) at paras 4.30 and 4.31.

178 *RTS Flexible Systems Limited v Molkerei Alois Müller GmbH* [2010] UKSC 14, [2010] 1 WLR 753 at [45] by Lord Clarke.

179 An agreement is made in a "commercial context" where its subject matter is "business matters" or "business relations", in contrast to "social or domestic matters": *Edwards v Skyways Ltd* [1964] 1 WLR 349, 355, by Megaw J; *Esso Petroleum Limited v Commissioners of Customs and Excise* [1976] 1 WLR 1, 4, by Lord Simon.

180 *Balfour v Balfour* [1919] 2 KB 571, 578, by Atkin LJ.

context, it will be presumed that the parties did not intend to create legal relations.[181] The party asserting that the document has legal effect will bear the burden of proving that it was intended to create legal relations.

3.65 We have, however, identified two aspects of smart legal contracting which may give rise to particular questions in determining whether the parties intended to create legal relations:

(1) where parties expressly state that they do not intend the agreement to be legally binding and wish instead to rely on performance of the code itself; and

(2) where the parties enter into a smart legal contract on a DLT system or smart contract platform without any prior natural language documents or communications passing between the parties.

We discuss each in turn below.

Clauses expressly disclaiming an intention to create legal relations

3.66 The parties to a smart legal contract might expressly state in a natural language clause that they do not intend the agreement to be legally binding. The parties may be content to trust in the automatic performance of the code to give effect to their agreement, and may seek to exclude the application of outside interferences, including contract law. Indeed, a desire to exclude institutional influence played a part in the development of DLT.[182]

3.67 The courts of England and Wales have given effect to clauses denying contractual intention in a number of cases.[183] Whether the clause actually has the effect of negating contractual intention is a question of construction, having regard to the words used, the relationship between the parties, and the agreement as a whole.[184]

3.68 Two consultees reported having advised clients on the use of such clauses in practice.[185] Linklaters said that, where clients have not wanted their code to amount to a legal contract, it had advised these clients to include a non-executable natural language statement in the code that the code is not intended to create legal relations.

---

181 *Balfour v Balfour* [1919] 2 KB 571, 578, by Atkin LJ.

182 See P de Filippi and A Wright, *Blockchain and the Law: The Rule of Code* (2018) pp 5 to 8 (noting that distributed ledger technology may enable parties to create their own "private regulatory frameworks", and could precipitate a shift from "legal rules and regulations administered by government authorities to code-based rules and protocols governed by decentralised blockchain-based networks").

183 *Rose and Frank Company v J R Crompton and Brothers* [1925] 1 AC 445; *Jones v Vernon's Pools Ltd* [1938] 2 All ER 626; *Appleson v H Littlewood Ltd* [1939] 1 All ER 464.

184 See *R v Lord Chancellor's Departments Ex p Nangle* [1991] ICR 743, where a statement in the Civil Service Pay and Conditions of Service Code that a "civil servant does not have a contract of employment enforceable in the courts" did not negate an intention to create legal relations, and *Home Insurance Co v Administratia Asigurarilor* [1983] 2 Lloyd's Rep 674, where an arbitration clause providing that the contract "shall be interpreted as an honourable engagement rather than as a legal obligation" did not negate an intention to create legal relations. See also para 6.14 of Chapter 6 where we discuss the validity of such a clause in the context of consumer contracts.

185 We asked consultees if they were aware of any instances where the parties to a smart legal contract had expressly agreed that they do not intend to create legal relations: call for evidence, question 16 at para 3.46.

The Chancery Bar Association and Commercial Bar Association (joint response) said that they were aware of cases in which parties had:

> agreed terms in a natural language contact 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.

3.69 However, the majority of consultees said they were unaware of instances where the parties had expressly disclaimed an intention to create legal relations with respect to their interactions on a DLT system or other smart contract platform. Allen & Overy said they had not encountered such clauses other than in "deliberate test environments set up by working groups or interested market participants".

3.70 It appears therefore that, while excluding the application of contract law is an option open to parties, it is not something that is common in practice at this point. Even though this may change as confidence in the technology grows, parties should consider carefully whether they wish to exclude the varied and flexible protections offered by the law. These protections become particularly significant where the code operates in ways the parties did not intend or expect, or where the code is hacked, or a bug otherwise exploited by third parties.

Intention to create legal relations when transacting on DLT systems

3.71 A more novel situation may arise where the parties enter into an agreement on a DLT system, or smart contract platform, without any natural language documents or communications passing between them. This could occur, for example, where parties interact and transact with one another on a DLT system using their private keys, or where the parties each deploy computer programs on a DLT system which subsequently interact and perform transactions. As these agreements are formed by conduct, rather than by words, the presumption of an intention to create legal relations may not apply.

3.72 Where parties have transacted on a DLT system or other smart contract platform, it is a question of fact as to whether those parties intended to create legal relations. Several factors may be relevant to that assessment, including the nature and purpose of the platform on which the code is deployed, and the nature of the transactions executed by the code. The courts of England and Wales have enforced agreements based solely on the parties' conduct where doing so is necessary to give "business reality" to their transaction, or where, in the circumstances, the parties would have expected enforceable obligations to exist.[186] As such, whether an intention to create legal relations may be inferred from the transactions on a distributed ledger might depend on the expectations of those who use a particular DLT system.

3.73 Several consultees commented on the circumstances in which parties may be found to have intended to create legal relations by transacting with one another on a DLT system.[187] The Chancery Bar Association and Commercial Bar Association (joint

---

[186] *The Aramis* [1989] 1 Lloyd's Rep 213, 224, by Bingham LJ; *Glencore Energy UK Ltd v OMV Supply & Trading Ltd* [2018] EWHC 895 (Comm), [2018] 2 All ER (Comm) 876 at [51] by Sir Ross Cranston.

[187] We asked consultees if they foresaw any difficulties in ascertaining whether the parties intended to create legal relations in this context: call for evidence, question 17 at para 3.51.

response) noted that the nature and circumstances of the transaction would need to be scrutinised carefully. They drew a distinction between an intention to create legal relations with respect to transactions performed by the code, and an intention merely to make use of the functionality of the code. Further, if performance of the code is "assured" – in the sense that it is guaranteed to execute –the transacting parties may not "need to consider whether legally enforceable rights would be useful to them, let alone intend (or be taken as intending) to create legal relations".

3.74 Similarly, Herbert Smith Freehills said that, in many cases, parties who deploy and interact with code on a DLT system do not intend to create legal relations, but are "instead trying to automate a particular process". Slaughter and May said that the intentions of the parties will necessarily depend on the circumstances of the transaction. For example, if a DLT system is designed to facilitate interbank payments, it should not be difficult to establish that banks who make payments on that system intend to create legal relations. In contrast, where a DLT system is "set up to train developers in a sandboxed environment", it would be obvious that participants on that system do not intend to create legal relations. Other cases may raise conflicting considerations. For example, parties might use a DLT system to transfer valuable assets in exchange for payment. The commercial nature of these transactions may suggest that the parties intended to create legal relations. However, the answer may be different if the DLT system is underpinned by an "anarchist" white paper, which expressly states that transactions on the system are not intended to create legal relations.

3.75 The assessment of whether parties intended to enter into a legally binding agreement could therefore be particularly complicated in the context of an agreement reached on a DLT system, or other smart contract platform. Parties who do intend such transactions to create legal relations would be well advised to make this clear in natural language. This could be done either in a separate agreement, or by way of non-executable natural language comments in the code.[188]

FORMALITY REQUIREMENTS

3.76 In general, contracts need not be made in any particular form. Contracts can be legally binding regardless of whether they are made in writing, orally or by conduct.[189]

3.77 However, there are exceptions to this general rule. For example:

(1) contracts for the sale or other disposition of an interest in land are void unless the contract is made in writing and signed;[190]

---

188 We discuss comments in code from para 2.7 and at para 2.51(2), and in Chapter 4 from para 4.75.

189 *MWB Business Exchange Ltd v Rock Advertising Ltd* [2018] UKSC 24, [2019] AC 119 at [7] by Lord Sumption; UKJT Legal Statement at [137].

190 Law of Property (Miscellaneous Provisions) Act 1989, s 2(1) and (3). Exceptions to the need for writing are set out in s 2(5), including for contracts to grant a short lease, and a contract made in the course of a public auction.

(2) contracts of guarantee are unenforceable unless they are evidenced in writing and signed;[191]

(3) regulated consumer credit agreements must be made in writing and signed by the creditor and debtor;[192] and

(4) a deed, when executed by an individual, must be signed in the presence of a witness who attests to the signature.[193] In the case of a company, the deed must be executed either by affixing the company's common seal, by the signatures of two authorised signatories (such as a director or company secretary), or by the signature of a director attested to by a witness.[194]

3.78 Failure to observe these requirements may render a contract void or unenforceable. Below, we consider whether it is possible for a smart legal contract to satisfy the "in writing" and "signature" requirements. We also consider the additional formality requirements that apply to deeds.

"In writing" requirements

3.79 Some contracts are required by statute to be made or evidenced "in writing". "Writing" is defined in schedule 1 to the Interpretation Act 1978 (the "1978 Act") as follows:

> "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.

3.80 Where a smart legal contract takes the form of a natural language agreement which is performed by code, it will satisfy the definition of "writing" for the purposes of the 1978 Act. This is because the terms of the smart legal contract are defined in the natural language document, and natural language constitutes "writing" for the purposes of the 1978 Act. However, to the extent that the terms of a smart legal contract are defined in code, the potentially novel question arises as to whether code can constitute "writing" for the purposes of the 1978 Act.

3.81 In Chapter 2 of this paper, we explain that the process of drafting a computer program will normally involve two steps.[195] First, the code is usually drafted in a "high level" programming language, known as source code. Source code uses a combination of words and symbols, and can be read by an expert coder. Second, the source code is ultimately converted into a "low level" programming language generally known as machine code. Typically, machine code is in binary form, and is impossible even for an expert coder to read.

---

191 Statute of Frauds 1677, s 4.

192 Consumer Credit Act 1974, ss 60 and 61; Consumer Credit (Agreements) Regulations 2010, SI 2010 No 1014, regs 3 and 4.

193 Law of Property (Miscellaneous Provisions) Act 1989, s 1(2)(b) and (3)(a).

194 Companies Act 2006, s 44.

195 We discuss this in more detail from para 2.3.

3.82 Below, we explain that source code can constitute "writing" for the purposes of the 1978 Act. However, whether source code will also satisfy a specific statutory "in writing" requirement will depend on the intention of Parliament when enacting that requirement and, in particular, whether the context indicates that source code falls within the meaning of "writing" for the purposes of that statute.[196] In addition, if the terms of a smart legal contract are said to reside in machine code or a lower level of code than source code that cannot be read by a human person, it will be more difficult to argue that the code constitutes "writing" for the purposes of the 1978 Act.

Source code

3.83 The definition of "writing" in the 1978 Act is an inclusive one. It was described by the Chancery Bar Association and Commercial Bar Association (joint response) as "extremely broad", and as an "ongoing enactment", designed to apply to new states of affairs such as those brought about by technological change. Generally, the courts of England and Wales adopt an "always speaking" construction to statutory interpretation. This means that, unless a contrary intention is expressed, a statute has an "ambulatory meaning" which may apply to circumstances that could not have possibly been foreseen at the time that the statute came into force.[197] In line with the approach of the courts in England and Wales to ongoing enactments,[198] the 1978 Act has an "always speaking" construction. It can, therefore, be interpreted to accommodate technological developments,[199] so long as they involve "representing or reproducing words in a visible form".

3.84 Source code can be considered a mode of "representing or reproducing words in a visible form" because it can be visibly displayed on a screen or printout, and is capable of being read by a person with knowledge of the relevant programming language. The consensus among consultees was that it was possible for source code to constitute "writing" for the purposes of the 1978 Act.[200]

3.85 The Digital Law Association said that source code is generally "the highest level code for a computer program", and that human programmers can "read and edit" source code. Florian Idelberger commented that the 1978 Act does not refer to "natural language or human language or anything similar", but simply requires the representation or reproduction of words in a visible form. Herbert Smith Freehills said that so long as source code can be "printed or read on a screen", it could amount to "writing". This conclusion was premised on source code being capable of being read

---

196 Interpretation Act 1978, s 5. See also D Feldman, D Bailey, and L Norbury, *Bennion, Bailey and Norbury on Statutory Interpretation* (8th ed 2020) s 19.10, which makes the point that a statutory reference to "writing" generally includes electronic writing. However, whether any given statutory reference to "writing" includes electronic writing will be ascertained by construing the intention of Parliament in the particular context.

197 A Burrows, *Thinking about statutes: interpretation, interaction, improvement* (2018) p 21.

198 For example, the Court of Appeal adopted this approach when interpreting the reference to a "document" in *Victor Chandler International Ltd v Customs and Excise Commissioners* [2000] 1 WLR 1296.

199 Electronic commerce: formal requirements in commercial transactions (2001) Advice from the Law Commission, https://www.lawcom.gov.uk/project/electronic-commerce-formal-requirements-in-commercial-transactions/ ("2001 Advice") para 3.7.

200 We asked consultees if they considered that source code could meet the definition of "writing" in the 1978 Act: call for evidence, question 18 at para 3.62.

by the coder who created it, or by another person who understands the relevant programming language.

3.86 Several consultees, including Allen & Overy, D2 Legal Technology and Clifford Chance, said that a contract drafted in source code can be considered analogous to a contract drafted in a foreign language. We agree that this is a useful analogy, bearing in mind that (unlike with foreign language contracts) a coder explaining the meaning of source code will also need to explain the effect of certain combinations of words. They will need to give their reasoned opinion as to what the code appeared to instruct the computer to do.[201] A contract drafted in source code is comprehensible to a coder in the same way that a contract written in a foreign language is comprehensible to a speaker of that foreign language. The fact that a contract may be comprehensible to a party or the court only with the aid of an expert translator does not prevent the contract from being "in writing". As Clifford Chance pointed out, "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". A similar view was expressed in the UKJT Legal Statement,[202] and endorsed by Allen & Overy.

3.87 Two consultees doubted whether source code could meet the definition of "writing" in the 1978 Act. These consultees said that, because the definition of "writing" is limited to modes of representing or reproducing "words", only contracts written in a language comprised of "words" can amount to "writing".

3.88 MBM Commercial said that source code may not fulfil the definition of "writing" because it is not "words" but rather "coded instructions". Coded instructions could be viewed as a mode of representing or reproducing words, but MBM Commercial thought that this was "far from assured". Similarly, Stephan Smoktunowicz commented that, to the extent that source code contains numbers and symbols which "affects the ordinary meaning of that code", then source code might not meet the definition of "writing".

3.89 However, as the Chancery Bar Association and Commercial Bar Association (joint response) said, the inclusion of numbers and symbols in source code does not prevent it from being "writing".

> 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.

3.90 In our view, source code can constitute "writing" for the purposes of the 1978 Act. However, reference to the definition of "writing" in the 1978 Act will not, on its own, answer the question of whether a source code will satisfy a particular statutory "in writing" requirement. The answer to this question depends on Parliament's intention in enacting that specific "in writing" requirement.[203] The 1978 Act also sets out that

---

201 We discuss this in more detail in Chapter 4 (Interpretation) from para 4.41.

202 UKJT Legal Statement at [164].

203 D Feldman, D Bailey, and L Norbury*, Bennion, Bailey and Norbury on Statutory Interpretation* (8th ed 2020) s 19.10.

words and expressions are to be construed by reference to the definition of "writing" in the 1978 Act unless the contrary intention appears in another Act.[204] As Professor Hugh Beale said:

> I think it may depend on the statutory context … and what the statute 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.

3.91 The context of the statute may indicate an intention that, for the purposes of that statute or the particular provision in question, source code does not fall within the meaning of "writing".[205] This may be on the basis of additional requirements related to the "in writing" requirement, such as that the writing must be in a particular form, or include particular content.[206] Where the relevant statute indicates a contrary intention (either explicitly or on the basis of its context), it is possible that source code will not satisfy that particular "in writing" requirement.

Machine code and other lower level codes

3.92 If the terms of a smart legal contract are said to reside in machine code or a lower level of code than source code, it will be more difficult to argue that the code constitutes "writing" for the purposes of the 1978 Act. In its 2001 advice on Electronic commerce: formal requirements in commercial transactions, the Law Commission considered that electronic data interchange ("EDI") messages would not satisfy an "in

---

204 Interpretation Act 1978, s 5.

205 See D Feldman, D Bailey, and L Norbury, *Bennion, Bailey and Norbury on Statutory Interpretation* (8th ed 2020) s 19.10. In *Cowthorpe Road 1-1A Freehold Ltd v Wahedally* [2016] EGLR 55, [2017] L & TR 4, the Court found that a counter-notice required to be "in writing" under the Leasehold Reform, Housing and Urban Development Act 1993, s 21 could not be served by email because it was required to be signed, which was taken to indicate an intention that an original paper copy had to be served. In our report on Electronic Execution of Documents (2019) Law Com No 386, https://www.lawcom.gov.uk/project/electronic-execution-of-documents/ (the "2019 report"), we noted that this decision was "unfortunate", particularly because the relevant provision about service by post was permissive rather than mandatory: 2019 report, para 3.68. The case has received mixed judicial treatment in so far as later decisions have found that emails were sufficient to satisfy a writing requirement in the context of provisions similar to s 21 of the Leasehold Reform, Housing and Urban Development Act 1993; see *Assethold Ltd v 110 Boulevard RTM Co Ltd* [2017] UKUT 316, [2017] 4 WLR 181. However, the uncontested point remains that a court will consider the context of a statute before determining whether the particular mode of writing will satisfy a statutory "in writing" requirement.

206 For example, the content of, and format for, regulated credit agreements within the meaning of the Consumer Credit Act 1974 is prescribed by the Consumer Credit (Agreements) Regulations 1983, SI 1983 No 1553 and the Consumer Credit (Agreements) Regulations 2010, SI 2010 No 1014. In particular, schs 2 and 3 to the 2010 Regulations include wording which must be reproduced in particular types of credit agreements.

writing" requirement.[207] This is because EDI messages take the form of binary data,[208] which cannot be read by a human person; it cannot be said that EDI messages "represent or reproduce words in a visible form". Like EDI, machine code is typically binary data which is not capable of being read by a human person, even if that person is an expert coder. We do not consider that such code can satisfy the definition of "writing" for the purposes of the 1978 Act.[209]

3.93 In between source code and machine code there are other intermediate levels of code, such as assembly code and object code. As we explain in Chapter 2,[210] both object code and assembly code can, depending on the programming language and the environment, be read by a human person.

3.94 Although we did not ask about object code directly, some consultees commented on whether object code can amount to "writing". Allen & Overy said that object code "will typically not be human readable in the manner necessary to constitute 'writing'". Similarly, D2 Legal Technology and the Law Society of England and Wales referred to the distinction between source code, on the one hand, and assembly and object code, on the other hand. These consultees said that, the lower the level of the code, the more difficult it will be to meet the definition of "writing". Catherine Phillips made the point that object code "that is written in binary form" should not amount to "in writing".

3.95 To the extent that the terms of a smart legal contract can be said to reside in a form of object code or assembly code that can be read by a human person, it is arguable that such code can constitute "writing" for the purposes of the 1978 Act. However, much will depend on the specific facts of the case. In particular, what will be relevant is the extent to which the code in question can be considered a mode of "representing or reproducing words in a visible form".

Legislative amendment to the definition of "writing"

3.96 Several consultees, including those of the view that source code can amount to writing, said that it may be beneficial to amend the definition of "writing" in the 1978 Act to make clear that it encompasses source code. As Allen & Overy suggested, such an amendment would "put the point clearly beyond doubt".

3.97 We do not consider that such an amendment is necessary. The definition of "writing" in the 1978 Act is not confined to a particular form or type of writing: it encompasses any mode of "representing or reproducing words in a visible form". So long as the relevant statute does not indicate a contrary intention (either explicitly or on the basis of its context), source code will also satisfy a specific statutory "in writing" requirement.

---

207 EDI involves the exchange of digital information designed to be acted upon by the software of the recipient system without the need for human intervention: see 2001 Advice, para 3.2, n 2 and para 3.9.

208 Binary data is data which can only take two possible forms, for example the digits 0 and 1.

209 Similarly, the UKJT Legal Statement at [167] concludes that if something cannot be "read", it does not satisfy an "in writing" requirement.

210 We discuss this in more detail at para 2.5.

Are the terms of a smart legal contract defined by the source code?

3.98 Where a smart legal contract is required to be "in writing", a preliminary question may arise as to whether the terms of the smart legal contract are defined by the source code, or by some lower level of code, such as assembly code or object code. This raises an issue of interpretation as to which "level" of the code was intended by the parties to define their agreement.[211]

3.99 The Chancery Bar Association and Commercial Bar Association (joint response) said:

> where it is necessary for a contract to be in "writing" (as that word is defined in the 1978 Act) 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 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.

3.100 Although we are of the view that parties are likely to agree to the terms as they exist at the level of the source code, parties may wish to consider specifying that their terms reside in the source code, to remove any potential uncertainty.

"Signature" requirements

3.101 In most cases, contracts governed by the law of England and Wales do not require a signature. Where the law does require a contract or agreement to be signed, the common law generally adopts a pragmatic approach, and does not prescribe any particular form or type of signature.[212] As we noted in our 2019 report on the Electronic Execution of Documents (the "2019 report"), a wide variety of handwritten and electronic signatures have been accepted as constituting valid signatures.[213] What is important is not the form of signature (unless this is prescribed by law), but whether it was applied in a manner which indicated the parties' intention to authenticate the document.[214]

3.102 Where a smart legal contract takes the form of a natural language agreement which is performed by code, the question of whether the contract has been "signed" can be answered in the traditional way. The court would consider whether the parties had indicated an intention to authenticate the natural language agreement by signing it by hand or electronically. In the case of a hybrid agreement, the signing of the natural language component of the agreement may be sufficient to authenticate the coded terms. In *Golden Ocean Group Ltd v Salgaocar Mining Industries PVT Ltd*,[215] the Court of Appeal held that the parties had "signed" a contract of guarantee by signing an email which referred to, but was not itself, the contract of guarantee. By signing the

---

211 We discuss this in more detail in Chapter 4 (Interpretation) at paras 4.50 and 4.51.

212 This is the case save where the contrary is provided for in relevant legislation or contractual arrangements, or where case law specific to the document in question leads to a contrary conclusion.

213 2019 report, pp 2 and 3.

214 *Golden Ocean Group Ltd v Salgaocar Mining Industries PVT Ltd* [2012] EWCA Civ 265, [2012] 1 WLR 3674 at [32] by Tomlinson LJ; UKJT Legal Statement at [160].

215 [2012] EWCA Civ 265, [2012] 1 WLR 3674.

email, the parties had indicated their intention to authenticate the contract of guarantee.[216] By similar reasoning, where parties sign a natural language document which refers to and explains the effect of the coded terms, the parties could be taken to have authenticated the coded terms.

Solely code contracts and digital signatures

3.103 Where a smart legal contract consists solely of code, the potentially novel question arises as to how the parties can "sign" the code. In the context of code deployed on a DLT system, parties can sign a piece of code by applying their digital signature to the relevant coded transaction. A digital signature is a type of electronic signature produced using asymmetric or public key cryptography.[217]

3.104 In general, participants in a DLT system have a "private" key, which they use to initiate transactions and which is kept secret, and a "public" key, which is shared with other participants. A participant's private key can be combined with the data of a transaction to create a digital signature for the participant, the authenticity of which can be verified by the recipient of the transaction using the participant's public key. Accordingly, a piece of code deployed on a distributed ledger could, depending on the circumstances, constitute an "offer" to participants within the system. A participant, Bob, could accept that offer by initiating a transaction which, in order to be validated, would require a digital signature. The resulting agreement could be considered to have been "signed" by Bob, given the use of his digital signature.

3.105 The majority of consultees agreed that parties can "sign" a solely code agreement through the use of digital signatures, generated using public key cryptography, as they are a form of electronic signature.[218]

3.106 The Digital Law Association said that each user on a DLT system has a unique private key that only they can use to initiate transactions. The use of that private key can therefore be "considered evidence that someone with access to that private key executed the transaction". Similarly, Allen & Overy said that the "very purpose" of public key cryptography is authentication and so, in principle, the use of a private key can amount to a signature. Linklaters noted that, in some cases, the use of a private key may not evidence an intention to authenticate, "particularly if the parties are not tech-literate". We agree that the private key and digital signature must be used in a manner which indicates the parties' intention to authenticate the coded transaction. However, this does not change the conclusion that a digital signature is capable of fulfilling a requirement for a signature in principle.

3.107 Several consultees noted that, in practice, parties who enter into solely code smart legal contracts are likely to interact with one another via a user interface. The Digital Law Association said that "the application of a digital signature can be simplified (or complicated) by blockchain wallet user interfaces". They provided the example of

---

216 *Golden Ocean Group Ltd v Salgaocar Mining Industries PVT Ltd* [2012] EWCA Civ 265, [2012] 1 WLR 3674 at [34] by Tomlinson LJ.

217 2019 report, Appendix 2.

218 We asked consultees if they considered that parties could "sign" an agreement defined solely by code and, if so, whether consultees were aware of any technologies currently in use or in development that facilitated this: call for evidence, question 19 at para 3.66.

Metamask, which we understand is an internet browser based wallet which a user can download to interact with the Ethereum network. The Digital Law Association said that, on Metamask, a user simply needs to "Confirm" the transaction in order to apply their digital signature. Peter Howes commented that, because users tend to interact with DLT systems via a user interface, users have a range of options for signing transactions with "different degrees of robustness and trustworthiness".

3.108 On the matter of the reliability and security of digital and other electronic signatures, we note the ongoing work of the Industry Working Group on Electronic Execution of Documents, established by the Ministry of Justice in response to a Law Commission recommendation.[219] Its members are drawn from the legal, business and technology sectors, and its terms of reference include developing best practice guidance for the use of electronic signatures, and an analysis of different technologies' security and reliability features. It is expected to produce an interim report over the course of the next few months.[220]

eIDAS Regulation

3.109 The eIDAS Regulation ("eIDAS"),[221] provides a regime for identity verification which establishes a common standard of "advanced electronic signature" ("AES") and "qualified electronic signature" ("QES") which can be recognised across member states in the EU. A signature is an AES if it is:

(1) uniquely linked to the signatory;

(2) capable of identifying the signatory;

(3) created using electronic signature data that the signatory can, with a high level of confidence, use under their sole control; and

(4) linked to the data signed therewith in such a way that any subsequent change in the data is detectable.

3.110 A signature is a QES if it satisfies the requirements for an AES and, in addition, is created using a qualified electronic signature creation device and is based on a certificate issued by a qualified trust service provider. Whether the detailed requirements for an AES or QES are satisfied will inevitably depend on the facts of each case, including the technical features of the particular DLT system or other smart contract platform. However, there appear to be no barriers to the use of eIDAS-compliant signatures in the context of smart legal contracts. The majority of

---

219 2019 report, from para 4.88. The Law Commissioner for Commercial and Common Law, Professor Sarah Green, is co-chair of the Group.

220 See https://www.gov.uk/government/news/new-expert-group-to-increase-confidence-and-standards-in-e-signatures for more information.

221 Regulation on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC (EU) No 910/2014 Official Journal L 257/73 of 28.08.2014 ("eIDAS"). At the end of the Brexit transition period, eIDAS was incorporated into domestic law (with some amendments) by operation of the European Union (Withdrawal) Act 2018, s 3(1), and the amendments contained in the Electronic Identification and Trust Services for Electronic Transactions (Amendment etc.) (EU Exit) Regulations 2019, SI 2019 No 89. The amendments to the provisions on eIDAS which apply to the new UK regime do not affect the discussion of eIDAS in this chapter.

consultees said that digital signatures are capable of satisfying the technical requirements for an AES or QES under eIDAS.[222]

3.111 Clifford Chance said that whether a digital signature fulfils the requirements for an AES or QES is "a question of fact to be considered on a case-by-case basis", depending on the "architecture" and "protocols" of the relevant DLT system. They commented that eIDAS compliant signatures are more likely to be used on permissioned DLT systems, where users are identifiable. Similarly, Dr Sara Hourani and Hendrik Puschmann (joint response) said that "private permissioned networks" can utilise eIDAS compliant signatures, but that this would be more difficult for public permissionless networks.

3.112 Consultees indicated that, at present, the use of eIDAS compliant signatures remains low in the UK. Peter Howes said that the "take up of eIDAS signatures in the UK is still very, very low", and Clifford Chance said that "eIDAS is not a framework commonly used in the UK (for DLT systems or otherwise)". As the use of eIDAS compliant signatures remains low in the UK, we do not address eIDAS in further detail in this paper.[223]

Deeds

3.113 A deed is a document by which an interest, a right or property passes or is confirmed, or a binding obligation is created or confirmed.[224] Deeds may be required by statute or common law. Documents which must be executed by deed include conveyances of land or interests in land and mortgages, powers of attorney, the appointment or discharge of a trustee, and agreements made without consideration.[225]

3.114 The law imposes a range of formality requirements in relation to deeds. In particular:

(1) a deed must be in writing;[226]

(2) the instrument must make clear on its face that it is intended to be a deed (the "face value" requirement);[227] and

(3) the instrument must be "validly executed as a deed".[228]

---

222 We asked consultees if they thought that smart legal contracts could utilise AES and QES and, if not, how smart legal contracts could be designed to accommodate these types of signatures: call for evidence, question 20 at para 3.73.

223 The Industry Working Group on Electronic Execution of Documents intends to publish an interim report over the course of the next few months which will cover, amongst other things, the use of eIDAS in the UK.

224 The Execution of Deeds and Documents by or on behalf of Bodies Corporate (1998) Law Com No 253, para 2.4; 2019 report, para 5.1.

225 See 2019 report, para 5.4.

226 The Execution of Deeds and Documents by or on behalf of Bodies Corporate (1998) Law Com No 253 (noting that this is a common law requirement); see also Law of Property (Miscellaneous Provisions) Act 1989, s 1(1)(a), abolishing any rule of law restricting the substances on which a deed may be written.

227 Law of Property (Miscellaneous Provisions) Act 1989, s 1(2)(a).

228 Law of Property (Miscellaneous Provisions) Act 1989, s 1(2).

3.115 In the case of a deed made by an individual, an instrument is validly executed as a deed if the instrument is signed by the individual "in the presence of a witness who attests to the signature".[229] Witnessing involves a person observing the execution of a document, and attestation involves the witness recording, on the document itself, that they have observed its execution.[230] In addition, an instrument, to be validly executed as a deed, must be "delivered as a deed". Delivery does not require the physical handing over of the deed to the other party, but rather an act or words by the person making the deed which signifies their intention to be bound.[231]

3.116 We consider that smart contract technology could potentially be used to create deeds. As in the case of smart legal contracts, a "smart deed" could take a number of forms. For example, a smart deed may be defined exclusively by natural language, with the maker of the deed deploying a piece of code on a DLT system or other smart contract platform to perform the terms of the deed. For this type of smart deed, whether the deed satisfies the above mentioned formality requirements would not give rise to novel legal questions. The terms of the deed would be defined exclusively by natural language.

3.117 However, we do not consider that parties can be confident that the current law supports the creation of deeds which are wholly or partly defined by code. Deeds are documents executed with a high degree of formality, and there is some uncertainty as to whether smart contract technology can facilitate compliance with the various formalities that apply to deeds. Consultees' views on this issue were mixed.[232] A piece of code could not take effect as a valid deed unless:

(1) the code constituted "writing";

(2) the code was clear on its face that it was intended to be a deed;

(3) the code was "signed" in the presence of a witness who attested to the signature; and

(4) the code was "delivered" as a deed.

3.118 We discuss each element below. Although an argument could be made in each case that a "smart deed" could satisfy the requirements, we think there is sufficient uncertainty that parties could not be certain of executing a valid smart deed. We intend to consider the challenges in a broader project on the law of deeds.

---

229 Law of Property (Miscellaneous Provisions) Act 1989, s 1(3).

230 2019 report, para 5.14.

231 See *Bibby Financial Services Ltd v Magson* [2011] EWHC 2495 (QB) at [335] by Judge Richard Seymour QC.

232 We asked consultees if they considered that a deed defined wholly or partly by code could satisfy the statutory formality requirements applicable to deeds: call for evidence, question 22 at para 3.81.

Compliance with formalities where a deed is drafted wholly or partly in code

Writing

3.119 As noted above, we consider that code, which can be read by a human person (such as source code) can satisfy the statutory definition of "writing" in the 1978 Act. On this reasoning, code which can be read by a human person can also constitute "writing" for the purposes of the common law requirement that a deed must be in writing.

Face value requirement

3.120 To be a valid deed, a written instrument must make it "clear on its face" that it is intended to be a deed. This requirement is typically satisfied by the inclusion of a verbal formula in the instrument (for example, "signed as a deed") which makes clear that the instrument is intended to be a deed. However, use of the word "deed" in the instrument is not essential.[233]

3.121 We think it would be possible for a deed defined wholly or partly by code to meet the face value requirement. Herbert Smith Freehills said that it may not be clear on the face of a solely code instrument that it is intended as a deed. However, they said it may be possible to include, as a non-executable comment in the code, a natural language statement that the code is intended to be a deed. Similarly, Clifford Chance commented that "technical solutions" exist that may allow a solely coded instrument to make clear on its face that it is intended as a deed.

Signing

3.122 A "smart deed" consisting of code could be signed through the use of a digital or other electronic signature, in the same way that a smart legal contract could. Stephan Smoktunowicz commented that the individual making the deed could create a digital representation of their signature in a signing platform, and that signature could be "embedded" into the code of the smart deed. Similarly, Florian Idelberger commented that an image or document containing the individual's signature could be uploaded to a signing platform "through an electronic address and hash tied" to the code constituting the smart deed.

3.123 The Chancery Bar Association and Commercial Bar Association (joint response) and STEP considered the example of a deed contained in an electronic file, consisting of natural language and code. A user could deploy that electronic file to a blockchain for execution by clicking a button in their wallet software. The coded component of the electronic file would then be executed by a smart contract on the blockchain. The user's act of clicking the button in their wallet software to deploy the electronic file "could be interpreted as the signing of the document". There may be no need for a further "on-chain" signing after the electronic file is deployed on the blockchain by the user.

Witnessing

3.124 In our 2019 report, we explained that the formality of witnessing involves "observing the execution of a document" and that, in principle, it was possible for an electronic

---

[233] See *Katara Hospitality v Guez* [2018] EWHC 3063 (Comm) at [45] to [46] by Moulder J.

signature to be witnessed.[234] However, we concluded that the current law probably does not support witnessing other than by the witness being physically present when the document is signed. We said:

> We are not persuaded that parties can be confident that the current law would allow for a witness viewing the signing on a screen or through an electronic signature platform, without being physically present. This conclusion is based on the combination of the restrictive wording of the statutory provisions and the serious policy questions underlying any extension to accommodate technological developments.[235]

3.125 Our conclusion applies equally to smart deeds, so that the witness should be physically present. Several consultees argued that the witness should not need to be physically present. The Society for Licensed Conveyancers said that if "identification verification checks can prove beyond all doubt that a person is who they purport to be", there should be no formal requirement that the execution of a deed must be witnessed in person. Similarly, the Digital Law Association said:

> It is interesting to consider whether a machine can functionally supply [an] 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?

3.126 Herbert Smith Freehills commented that, over time, machines are likely to provide an "acceptable substitute function and process to witnessing (and possibly to a higher standard of fidelity than the traditional physical witnessing)". Clifford Chance also commented that the physical witnessing requirement "seems outdated", and that alternatives to physical witnessing using assistive technology should be considered.

3.127 We agree that there may be good reasons to allow for safeguards other than physical witnessing. However, we think this would require law reform. As we discuss below, the Law Commission intends to proceed with a review of the law of deeds when resources allow. In the meantime, we think parties would be well advised to ensure that a witness is physically present when the principal signs (albeit that the witness could sign and attest electronically, as discussed below).

Attestation

3.128 In our 2019 report, we concluded that a witness could provide attestation using an electronic signature.[236] However, we noted the complications highlighted by the decision in *R (Mercury Tax Group Ltd) v Her Majesty's Commissioners of Revenue and Customs ("Mercury")*.[237] In *Mercury,* Mr Justice Underhill (as he then was) said that, under section 1 of the Law of Property (Miscellaneous Provisions) Act 1989,

---

234 2019 report, paras 5.14 and 5.20.

235 2019 report, para 5.35.

236 2019 report, para 5.54.

237 [2008] EWHC 2721 (Admin), [2009] STC 743.

"signature and attestation must form part of the same physical document".[238] He also referred to a document as needing to be "a discrete physical entity (whether in a single version or in a series of counterparts) at the moment of signing".[239] These statements raise the question of how a witness can attest to the signing of a piece of code.

3.129 Clifford Chance said that, where the terms of a deed defined by code are "split across various linked execution files", it may not be possible to say that the code constitutes the "same physical document", or a "discrete physical entity" at the moment of signing. Similarly, Peter Howes said:

> Because of the manner in which transactions are added to DLT systems (individually or in blocks) it is unlikely that the smart contract [and] transactional personalisation (like signature and attestation) would be able to be considered as a single physical document even though they would be cryptographically linked.

3.130 As noted above, the Chancery Bar Association and Commercial Bar Association (joint response) and STEP said that a user who deploys an electronic file on a blockchain from their digital wallet could be taken to have "signed" the code contained in the file. However, these consultees commented that it is unclear how the signing of that code could be attested. They said that a witness could deploy an identical copy of the electronic file to the blockchain from their digital wallet, and so be taken to have "signed" that electronic file. However, in their view, this would not constitute an attestation of the original electronic file. Such an approach therefore "falls foul" of the statement in *Mercury* that signature and attestation must form part of the "same physical document".

3.131 Allen & Overy said that, if a witness were to provide attestation by affixing a "digital signature to the code", it would be prudent for the parties to include a non-executable comment in the code. This comment could state that the digital signature has been affixed for the purpose of attestation. The Digital Law Association noted that digital signatures are "date-stamped", and that this feature of digital signatures could be "particularly relevant for highlighting whether the witness signed before or after the other signatories".

3.132 Although it may not be insuperable, it appears that complying with the requirements of *Mercury* may be the biggest challenge in relation to smart deeds.

Delivery

3.133 As we have noted, "delivery as a deed" does not require the physical handing over of the deed to the other party, but rather an act or words by the person making the deed which signifies their intention to be bound.[240] Herbert Smith Freehills said that acts sufficient for delivery could be "recorded on a smart contract platform". Similarly,

---

238 *R (Mercury Tax Group Ltd) v Her Majesty's Commissioners of Revenue and Customs* [2008] EWHC 2721 (Admin), [2009] STC 743 at [40].

239 *R (Mercury Tax Group Ltd) v Her Majesty's Commissioners of Revenue and Customs* [2008] EWHC 2721 (Admin), [2009] STC 743 at [39].

240 See *Bibby Financial Services Ltd v Magson* [2011] EWHC 2495 (QB) at [335] by Judge Richard Seymour QC.

Clifford Chance said that "specific wording or technical solutions exist" that would allow the delivery requirement to be satisfied.

Are "smart deeds" being used in practice?

3.134 It appears that smart contract technology is not currently being used to create deeds. This is, perhaps, a reflection of the legal uncertainties around the use of smart contract technology in this context.

3.135 The majority of consultees said that they were unaware of cases in which the terms of a deed have been defined or performed by code.[241] STEP said that code "could be constructed to resemble a deed, although we have not seen a smart contract like that yet".

3.136 Eversheds Sutherland said that they take a "conservative approach to transactions involving deeds", and would "not advise" parties to use code to draft a deed or to perform the terms of a deed. This echoes our view. Allen & Overy said that they would expect parties to define the terms of a deed in natural language rather than in code. The code could then be used to perform the obligations of a deed, but this will not always be feasible or practical.

Need for further work to facilitate smart deeds

3.137 Stephan Smoktunowicz said that the law should be clarified to "allow smart deeds to be created with confidence in addition to smart contracts". Linklaters also said that, to ensure legal certainty, it would be helpful to clarify in statute how parties could make deeds wholly or partly defined by code.

3.138 In our 2019 report, we recommended that the Law Commission be asked to undertake a review of deeds, and the Lord Chancellor has agreed that such a review should be undertaken when resources allow. The Law Commission has been told by stakeholders that the formality requirements for deeds are outdated, and no longer fit for purpose, making them unduly onerous for commercial parties. This view was repeated by stakeholders in their responses to the recent consultation on areas of law which should be reviewed as part of the Law Commission's 14th programme of law reform, which asked specially about a review of the law of deeds.[242]

3.139 In its review, the Law Commission will assess the current requirements for the execution of deeds, including in the context of current and emerging technologies, and will make recommendations for reform.

LEGISLATING TO CONFIRM THE VALIDITY OF SMART LEGAL CONTRACTS?

3.140 As we have discussed in this chapter, it is clear that smart contracts used in particular ways can satisfy the requirements for the formation of a legally binding contract under the law of England and Wales. We do not think that anything further is required in law

---

241 We asked consultees if they were aware of any cases where parties had arranged for the terms of a deed to be defined or performed by code: call for evidence, question 21 at para 3.80.

242 Generating ideas for the Law Commission's 14th programme of law reform (March 2021), https://www.lawcom.gov.uk/14th-programme-kite-flying-document/#Deeds.

to confirm this and, as discussed briefly below, we do not think that any confirmatory legislative statement to such effect would be helpful.

3.141 In their responses to the call for evidence, consultees noted that various states in the United States of America, including Arizona, Illinois and Tennessee, have introduced legislation which defines the term "smart contract". Such legislation also provides that a contract is not to be denied legal validity or enforceability solely because it is a smart contract (as defined by the legislation), or because it contains a smart contract term.

3.142 The Chancery Bar Association and Commercial Bar Association (joint response) highlighted the approach of Arizona 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).

The Chancery Bar Association and Commercial Bar Association suggested 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".

3.143 We can see the attraction of such an approach, particularly from a presentational perspective in order to give market participants "at a glance" confirmation. However, we think that, at least at the moment, legislating in this way may cause more harm than good.

3.144 In particular, any legislative definition of "smart contract" (or "smart legal contract", in our terminology) may be relatively quickly rendered obsolete by technological developments. Alternatively, any legislative definition may have the opposite effect, and fail to allow scope for technological developments which would not benefit from the confirmatory provision. Pointing to similar legislation passed by Illinois and Tennessee, DLA Piper UK commented that "broad definitions have been adopted in order to prevent regulation from becoming obsolete as technology develops". However, even relatively broad definitions may be too specific given both the desirability and difficulty of remaining technology-neutral.

3.145 For example, the definition in the Arizona legislation specifically refers to distributed ledger technology. As we discuss in Chapter 2, our call for evidence proceeded on the assumption that smart legal contracts would make use of DLT, being the predominant technology currently referenced in this space.[243] However, consultees cautioned against limiting the concept in this way, and in this paper we have moved away from DLT as a defining concept. We have also concluded that traditional contracts and smart legal contracts exist on a spectrum, given the potential for a mix of natural language and coded terms, and without any consensus on an appropriate definition.

---

[243] We discuss this from para 2.30.

On the latter point, DLA Piper UK noted the “lack of uniformity in the wording of [the US] definitions, which presents the risk of divergence between states and jurisdictions as further legislation emerges”.

3.146 Given our conclusion that smart legal contracts can satisfy the requirements for a contract, a legislative statement that smart contracts are capable of being legally enforced (or to confirm that a contract is not unenforceable merely because it is a smart legal contract) seems unnecessary. In the absence of a real need for legislation, we do not think it would be justified.

3.147 We anticipate that market standards and guidance will develop to assist industry participants, and those considering using or developing smart legal contracts. We hope too that the analysis set out in this paper will help to explain some of the legal considerations of which parties should be aware.

Chapter 4: Interpretation of smart legal contracts

4.1 In this chapter, we consider how the principles of contractual interpretation could be applied if a court were asked to interpret a smart legal contract.

4.2 Contractual interpretation is the process by which a court determines the meaning of the language used by the parties in the express terms of a written agreement.[244] Given that computers do not "interpret", but merely execute coded instructions, it may be tempting to conclude that coded terms are not susceptible to the exercise of contractual interpretation at all,[245] or that the principles of interpretation are redundant when interpreting coded terms. As we discuss in this chapter, some consultees adopt these views.

4.3 We suggest, however, that coded terms can (and should) be susceptible to contractual interpretation. To find otherwise would be to excise a large body of law from the ambit of smart legal contracts that contain coded terms. It is therefore important to determine the appropriate test for ascertaining the meaning of coded terms. After explaining the situations in which we think interpretation could be relevant, we discuss what an appropriate test could be.

THE PRINCIPLES OF CONTRACTUAL INTERPRETATION

4.4 The courts of England and Wales take an objective approach to contractual interpretation. The court does not ask what the parties themselves meant by the language they used. Rather, the court asks what the language would have meant to a reasonable person, equipped with all the background knowledge available to the parties at the time the contract was made.[246]

4.5 The Supreme Court has emphasised that, in considering what the reasonable person would have understood the language used in a contract to mean, primacy should be given to the natural and ordinary meaning of the language.[247] If the natural and ordinary meaning of the words used by the parties is clear, then the court will generally be slow to depart from it. Consideration of the background and surrounding circumstances should not be used to "undervalue the importance of the language",[248] although these factors assume greater significance if the natural meaning of the language is unclear.

4.6 The language of the contract is therefore given primacy in the interpretation of the contract, with other information (such as business common sense and context) only serving to assist with the objective interpretation of the language used. Evidence of

---

244 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 15-047.

245 UKJT Legal Statement at [150].

246 *Chartbrook Ltd v Persimmon Homes Ltd* [2009] UKHL 38, [2009] 1 AC 1101 at [14] by Lord Hoffmann.

247 *Arnold v Britton* [2015] UKSC 36, [2015] 2 WLR 1593 at [17] by Lord Neuberger.

248 *Arnold v Britton* [2015] UKSC 36, [2015] 2 WLR 1593 at [18] by Lord Neuberger.

the subjective intentions of the parties (including evidence of their prior negotiations) as to the meaning of the words used is not admissible.[249]

Are coded terms amenable to interpretation?

4.7 This chapter, and the questions we asked in the call for evidence, presuppose that the principles of contractual interpretation apply to the coded terms of a smart legal contract. However, in response to the call for evidence, several consultees took issue with the very notion of applying the principles of interpretation to coded terms.

4.8 For example, Professor Hugh Beale said:

> 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.

4.9 The LawTech Sounding Board made a general argument that the current principles of contractual interpretation are "unsuitable for application to the coded terms of a smart contract". They said that:

> [The principles of contractual interpretation] 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.

4.10 We do not agree with these views. In particular, although a computer "does not think and evaluate", we do not agree that the code simply "means what the code does when it is executed", or that it has no meaning, and only an effect. The following example helps illustrate why we disagree with such an approach: an upgrade to an operating system results in legacy code no longer performing in the way that it used to.[250] After the upgrade, one of the parties argues that performance of the code is no longer in accordance with what the coded terms "mean" on their proper interpretation; the other party disagrees.

4.11 In this case, a dispute is likely to arise as to the "meaning" of the coded terms. If we say that the code only means what it does when it is executed, the meaning of the code would change in every instance depending on how the code responded to the system upgrade. However, we do not think it makes sense to say that the meaning of the code has changed in each case, because the code itself has not changed; instead, it must be the outcome that has changed. If we accept this, it then follows that there can be a divergence between what the code "means", and what it does when it is executed, which entails a distinction between meaning and effect. The interesting question that then arises is: how does one ascertain the meaning of the code?

---

249 *Chartbrook Ltd v Persimmon Homes Ltd* [2009] UKHL 38, [2009] 1 AC 1101. We discuss this further from para 4.98.

250 Transpact said that an upgrade to a programming language may unintentionally cause the same computer program to run differently.

4.12 We agree with the UKJT Legal Statement that "it is unnecessary to declare smart [legal] contracts as a special category of contracts to which the normal rules of interpretation are dis-applied".[251] We consider that there are several ways in which a dispute could arise about the "meaning" of the coded terms of a smart legal contract. The upgrade to the operating system above is one example. Alternatively, if the coded terms have been performed in a way which one of the parties did not expect, the "meaning" of the coded terms may be the subject of interpretation in a dispute. We discuss other examples in the remainder of this chapter.

IDENTIFYING THE TERMS OF A SMART LEGAL CONTRACT

4.13 In Chapter 2, we identified three forms that a smart legal contract could take, depending on the role played by the code.[252]

(1) Natural language contract with automated performance.

(2) Hybrid contract.

(3) Solely code contract.

4.14 We explained that all three forms of smart legal contract involve the use of computer code. What distinguishes the three forms is the role played by the code. In the first form of smart legal contract, the role of the code is limited to performing obligations which are defined in the natural language contract. In contrast, in the second and third forms, the code is used to define contractual obligations, as well as to perform them.

4.15 The first step in interpreting a smart legal contract is to identify how the terms of the agreement are defined.[253] The answer to this question may have significant implications for the remedies available to the parties, should problems arise in relation to the formation or performance of the smart legal contract.[254] We agree with the UKJT Legal Statement that ascertaining the role played by the code itself raises a question of interpretation:

> A judge's task when interpreting a smart [legal] contract is to determine … what the parties objectively intended their obligation to be. Where there is code involved, part of that exercise will be a determination of whether the code (or part of it) was intended to define the obligations or whether it was intended merely to implement them.[255]

---

251 UKJT Legal Statement at [150].

252 We discuss the three forms of smart legal contract in more detail from para 2.51.

253 We discussed this in the call for evidence at paras 4.7 and 4.8.

254 For example, it may be difficult to obtain the remedy of rectification if the terms of a smart legal contract are defined solely in code. It may also be difficult to establish a breach of contract if the terms of the smart legal contract are defined solely in code. We discuss these issues in more detail in Chapter 5 (Remedies).

255 UKJT Legal Statement at [152].

4.16 Echoing our views, and those of most consultees,[256] the Chancery Bar Association and Commercial Bar Association (joint response) said there "is no conceptual difficulty" in applying the principles of interpretation to identify how the terms of a smart legal contract are defined. They made the point that in certain circumstances, "the function that a smart contract performs may itself assist in the interpretative task". The example provided was one where the code performs a function that "makes no sense unless that function embodies a contractual right". In this case, the fact that the parties deployed that smart legal contract was said to be a "strong indicator" that they intended the code to be a contractual term. DLA Piper UK commented that, in cases where it is unclear how the contractual terms are recorded, the "established principles of interpretation" will enable a court to identify the relevant terms. They said that such principles were sufficiently "flexible enough to allow the court to interpret agreements and their terms in a very broad range of circumstances".

4.17 Where the smart legal contract involves natural language terms, the parties' intentions as to the role of the code may be apparent from those terms. Indeed, the parties might agree expressly that the natural language terms constitute the "entire agreement" between the parties. The addition of such a provision would make clear that the parties objectively intended their agreement to be recorded in natural language, with the code merely being used to automate performance of that agreement. Allen & Overy said that "the natural language component should make the position explicitly clear, particularly for complex commercial contracts" but that, in other cases, the existing principles of interpretation would suffice to answer the question. The Chancery Bar Association and Commercial Bar Association (joint response) confirmed that whether the code is a source of contractual terms, or rather a mechanism to implement natural language terms, "is very likely to be answered by a 'traditional' exercise of construing the natural language element".

4.18 However, where the parties have not dealt with the matter expressly in natural language, there may be challenges for a court in determining what the parties intended the role of the code to be. Herbert Smith Freehills said, in certain circumstances, they anticipate difficulties to arise in identifying whether terms are contained in the natural language component, or the coded component, or both. They provided the example of where there is an overlap between the natural language element and the coded element, or where the parties have expressed the same aspect of the smart legal contract in both natural language and code. Dr Sara Hourani and Hendrik Puschmann (joint response) noted that applying the principles of interpretation in this context could be challenging because "the judge would need to be technologically savvy".

4.19 Although we consider that the existing principles of interpretation can be applied to identify the terms of a smart legal contract, parties would be well advised to make clear the role of the code in their smart legal contract.

---

[256] We asked consultees if they foresaw any difficulties in applying the principles of interpretation to identify whether the terms of a smart legal contract are defined in the natural language component, or the coded component, or both: call for evidence, question 23 at para 4.10. The majority of consultees did not foresee any difficulties in applying the principles of interpretation in this way.

APPLYING THE PRINCIPLES OF INTERPRETATION TO SMART LEGAL CONTRACTS

4.20 Novel interpretation issues are unlikely to arise where the terms of a smart legal contract are recorded exclusively in a natural language contract, and a piece of code merely automates performance of those terms. The natural language contract will be treated as containing the terms agreed to by the parties, and it will be those terms that the court will be called upon to interpret. The court will only look to the code if it is asked to consider whether the code correctly implements the terms of the natural language agreement.[257] However, where the terms of a smart legal contract are defined partly or solely in code, this potentially poses difficulties for contractual interpretation. The principles of interpretation have been developed in response to the courts seeking to interpret natural language terms. This raises a question as to how existing principles can be used to interpret coded terms where disputes about the "meaning" of such terms arise.

Disputes about the coded terms of a smart legal contract

4.21 A court may be asked to interpret the coded terms of a smart legal contract in a variety of circumstances.[258] First, situations may arise where the parties disagree as to the meaning of the terms of that contract. Such a dispute would usually arise where one party has done something, or has failed to do something, which another party considers to be a breach of contract. In addition, a court may be required to interpret the coded terms of a smart legal contract as a preliminary step before awarding any relief to an aggrieved party. For example, if a party argues that the smart legal contract is void for unilateral mistake, a court may have to understand what those terms "mean" on their proper interpretation before assessing whether or not there is such a mistake.

4.22 Additional examples of where disputes about the meaning of the coded terms of a smart legal contract might arise are discussed below.

Meaning of the natural language terms in a hybrid smart legal contract

4.23 A dispute may arise about the meaning of the natural language terms in a hybrid smart legal contract. As the courts of England and Wales interpret the terms of a contract as a whole, what the coded terms "mean" may be relevant to the court's interpretation of the natural language terms in dispute.

Rectification of the coded terms

4.24 A party may argue that the coded terms should be rectified on the basis that they fail to give effect to the parties' actual common intention at the time the contract was concluded.[259] To determine whether the code should be rectified, the court may have

---

257 If the code fails to perform the natural language contract in accordance with its terms, a party to a smart legal contract may have a claim for breach of contract. We discuss this from para 5.112.

258 We asked consultees to provide examples of, and circumstances in which, disputes about the proper interpretation of the coded terms of a smart legal contract might arise: call for evidence, question 24 at para 4.15.

259 We discuss this scenario in more detail from para 5.8.

to determine what the coded terms "mean", and whether that meaning accords with the parties' actual common intention at the time of contracting.

Conflict between the terms of a smart legal contract

4.25 Disputes about the proper interpretation of the coded terms of a smart legal contract are likely to arise where the coded terms conflict with other terms of the agreement. In particular, we think that a conflict of terms is most likely to occur in the case of a hybrid smart legal contract, where the terms are defined in both natural language and in code, and indeed where the same term can be expressed in both natural language and in code.

4.26 The Digital Law Association agreed that disputes about coded terms are likely to occur where the parties express a term in both natural language and in code, without specifying which term takes priority in the event of a conflict. Allen & Overy similarly thought that:

> 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 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 by applying established principles.

4.27 The general approach to resolving potential inconsistencies between different terms of the same contract is for the court to try to reconcile the two, having regard to the contract as a whole.[260] This approach applies regardless of whether the clauses of the contract are found in a single document, or in two or more separate documents which together make up one contract.[261]

4.28 To assist the court in resolving disputes between coded and natural language terms, the natural language component of a hybrid smart legal contract may include a term setting out an order of precedence to deal with such conflicts.[262] Particularly in cases where there is an overlap between the natural language and coded terms, parties would be well advised to stipulate which of the two expressions of the term is the primary one, or which takes precedence in the event of a conflict. The order of precedence term will only be applied if the potentially inconsistent terms cannot be reconciled.[263]

Code does not perform as intended

4.29 Catherine Phillips made the point that disputes about coded terms may arise where the "outcome of a feature of the code" becomes apparent only after the code has

---

260 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 9.73.

261 *Cobelfret Bulk Carriers NV v Swissmarine Services SA* [2009] EWHC 2883 (Comm), [2010] 2 All ER (Comm) 128.

262 Such clauses are known variously as conflict, priority or prevail clauses and are used in natural language contracts to determine priority between conflicting agreements or between parts of agreements.

263 *RWE Npower Renewables Ltd v JN Bentley Ltd* [2014] EWCA Civ 150, [2014] All ER (D) 167 (Feb) at [15] by Moore-Bick LJ.

been deployed. This view was echoed by Allen & Overy, who said that disputes about the proper interpretation of coded terms may arise where the code performs "differently to how one or both of the parties had expected". Herbert Smith Freehills also mentioned the circumstance where the code has been altered by a third party acting in bad faith (or "hacked", as Eversheds Sutherland put it). In such cases, the court may be required to interpret the coded terms to understand the changes made to the code.

Predictability of performance of the code

4.30 Performance of the coded terms of a smart legal contract cannot always be predicted based on a reading of the code.[264] Dr Robert Herian said that variations between performance of the code and a reading of the code could be due to "unforeseen unintended changes by third parties such as hackers". Dr Sara Hourani and Hendrik Puschmann (joint response) said that performance of the code may not always be predictable based on a reading of the code due to errors or bugs in the code.[265] Herbert Smith Freehills said that poorly written code, or code which relies on additional dependencies,[266] can also lead to a discrepancy between a reading of the code and its performance. Transpact pointed out that performance of the code can differ from its reading if the code unintentionally performs differently due to "different but similar hardware", or if an upgrade to an operating system causes the code to perform unexpectedly.

4.31 The fact that performance of the code cannot always be predicted based on a reading of the code increases the scope for disputes (and therefore the need for contractual interpretation) of coded terms.[267] Below we consider how the existing principles of interpretation could be applied to interpret the coded terms of a smart legal contract.

The appropriate test for interpreting coded terms

4.32 There appear to be two alternative avenues for ascertaining the meaning of a coded term of a smart legal contract, other than asking what a reasonable person would understand the coded term to mean. One approach would be to ask how the coded term would be understood by a functioning computer. Another would be to ask what a person with knowledge and understanding of code would understand the coded term to mean. Below, we consider each of these possibilities, and conclude that the most

---

264 We asked consultees if they thought that performance of the coded terms of a smart legal contract could not always be predicted based on a reading of the code: call for evidence, question 26 at para 4.31. The majority of consultees thought that performance of the coded terms could not always be so predicted.

265 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 47 where the point is made that "there are between 1 and 25 errors every 1000 lines of code".

266 "Dependency" is a broad term used to refer to the situation where one piece of software relies on another. As Herbert Smith Freehills explained, if code relies on additional code dependencies, it will not usually be possible to predict the performance of the code without either reference to the source code of the dependencies, or an ability to run the dependent code.

267 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 37 for a similar view, and where the point is made that "unexpected events occur, requiring the court to interpret how to adapt smart contracts' obligations".

appropriate test would be that of a person with knowledge and understanding of code – that is, a "reasonable coder".[268]

What the code means to a reasonable person

4.33 When interpreting a contract, the courts of England and Wales ask what the language of the contract would have meant to a reasonable person, equipped with all the background knowledge available to the parties at the time the contract was made. This approach makes sense where what is being interpreted is a term recorded in natural language. Natural language terms are designed to be read by human persons, and so it makes sense to ask what a reasonable person would have understood those terms to mean. However, code is not written with a reasonable person in mind. It is directed at a computer. Asking what a reasonable person would understand a coded term to mean is unlikely to assist in ascertaining the meaning of such term.

4.34 Nonetheless, a few consultees thought that the meaning of a coded term should be determined by asking what the term would mean to a reasonable person. MBM Commercial said that "the man on the Clapham Omnibus" would favour adopting this test. Herbert Smith Freehills thought that the meaning of a coded term 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.

In their view, the background knowledge would include the "reasonable person having the meaning of the code sufficiently conveyed to them".

4.35 However, several consultees were sceptical of this approach. Slaughter and May said that "a reasonable person is unlikely to be able to understand the meaning of a coded term". As such, determining the meaning of such a term by reference to a reasonable person would, in their view, be "to determine that the coded term is unintelligible to the court". They said that such an approach would be unproductive. Similarly, Allen & Overy thought that since a reasonable person might not even understand code, "adopting the [reasonable person test] would not be feasible to give proper efficacy to the coded terms of a smart contract".

4.36 The Digital Law Association said that "a reasonable person without a coding background should not be relied upon to interpret or understand a coded term without assistance". In a similar vein, Lloyd's of London commented that applying 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". We agree with the view expressed by these consultees. Since code is not written with a reasonable person in mind, asking what a reasonable person would understand a coded term to mean is unlikely to assist in ascertaining the meaning of such term.

---

[268] We asked consultees if they thought the meaning of a coded term 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: call for evidence, question 25 at para 4.30.

What the code means to a functioning computer

4.37 As computer code is designed for the special purpose of instructing computers, one potential approach to interpreting coded terms would be to ask what the code "means" to a functioning computer. Given that the language of code can only have one "meaning" to a computer, interpreting the code under this test may be as simple as observing the outcome of its performance by the computer. On this approach, the code may simply "mean" what it does when it is executed. This method of interpreting coded terms has the benefit of certainty, and can be easily applied. Even so, only a few consultees endorsed it. The Chancery Bar Association and Commercial Bar Association (joint response) thought this approach would be "appropriate" in the majority of cases because "the question of meaning as such will not typically arise in the context of the coded terms" of a smart legal contract. Instead, "the code does what it does and that embodies and amounts to the contractual intent".

4.38 A potential problem with this approach is that it could be said to pay insufficient regard to the intention of the parties. As DLA Piper UK put it, even though code is, by its very nature, "unambiguous from a computer's perspective, it will not always accurately reflect the parties' intentions". Relatedly, the Law Society of England and Wales said that what a coded term means to a computer can be "far from the intention of the parties". Slaughter and May made the point that, under this test, "the meaning of the coded term is reduced to its output", and "there is no real room for the court to interpret the term at all: its meaning will be plain and immutable". This was said to place "limits" on the courts' ability to interpret coded terms. Herbert Smith Freehills pointed out that determining meaning by asking what a coded term means to a functioning computer "would bear no resemblance to the existing rules of contractual interpretation".

4.39 We agree with consultees that ascertaining the meaning of a coded term should not be conducted by asking what the coded term would mean to a functioning computer. To do so would entail reducing interpretation of the code to simply observing its performance, or "output". Even though the language of code only has one "meaning" to a computer, and therefore may be unambiguous from the computer's perspective, there may be situations in which the code behaves in ways not intended by the parties to the contract.[269] In this regard, we are reminded of the words of Lord Neuberger in *Arnold v Britton*:

> In some cases, an event subsequently occurs which was plainly not intended or contemplated by the parties, judging from the language of their contract. In such a case, if it is clear what the parties would have intended, the court will give effect to that intention.[270]

What the code means to a reasonable person with knowledge and understanding of code

4.40 A person unfamiliar with code is very unlikely to be able to interpret it. In the call for evidence, we suggested that an alternative, preferable test to ascertaining the "meaning" of coded terms would be to ask what the coded terms mean to a

---

269 UKJT Legal Statement at [136].

270 [2015] UKSC 36, [2015] 2 WLR 1593 at [22].

reasonable person with knowledge and understanding of the relevant code.[271] We explained that courts are accustomed to receiving expert evidence on the meaning of contractual terms drafted in a foreign language. The expert evidence received in those cases does not, however, determine the meaning or legal effect of the foreign language terms, but merely puts those terms in a language which the court can understand. It is for the court to then determine what the terms (as translated) would mean to a reasonable person, applying the principles of contractual interpretation.[272]

4.41 An expert coder could assist the court by translating the code in the same way as any other contract written in a language unfamiliar to the court. Nonetheless, a court may not be able effectively to interpret that natural language translation in the same way as it could with the translation of a foreign language. This could be because the court is unfamiliar with the way instructions in code are interpreted by a computer, or with the way a coder might arrange instructions in order to elicit a particular outcome from the running of a code. Take the example of a basic, natural language instruction to make a purchase from a shop.

> Go to the shop and buy a newspaper. If there are any eggs, get a dozen.[273]

4.42 A likely human response to this instruction is to buy a newspaper and, in the event that the shop has eggs, to buy a dozen eggs as well. A computer, on the other hand, presented with this instruction (in code form) will buy a newspaper and, in the event that eggs are also available, will buy 12 newspapers rather than one.[274] It is therefore unlikely to be sufficient, for the purposes of assisting the court in interpreting a coded term, for an expert coder merely to translate the code into natural language. Instead, the coder will need to explain the effect of certain combinations of words, and give their reasoned opinion as to what the code appeared to instruct the computer to do.

4.43 This approach shifts the role of interpretation from the judge towards experts. However, this kind of shift is not entirely unprecedented; an analogy can be made with the *Bolam* test in the tort of negligence.[275] The test involves the court asking whether the defendant's actions were in accordance with a practice accepted by a responsible body of professional opinion. The logic behind the test is that trained professionals are in a far better position to give an opinion on the standards within their own profession than those trained solely in law.[276] The court is not bound by the outcome of a *Bolam* enquiry. Where the body of professional opinion "cannot be logically supported at all", the court can reject it as a standard against which to assess the defendant's conduct.[277]

---

271 Call for evidence, para 4.17.

272 See K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 5.53.

273 We also used this example in the call for evidence, at para 4.25.

274 S Green, "Smart contracts, interpretation and rectification" (2018) 24 *Lloyd's Maritime and Commercial Law Quarterly* 234, 245.

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

276 S Green, "Smart contracts, interpretation and rectification" (2018) 24 *Lloyd's Maritime and Commercial Law Quarterly* 234, 246.

277 *Bolitho v City & Hackney Health Authority* [1998] AC 232, 243, by Lord Browne-Wilkinson.

4.44 A potential difficulty in receiving evidence provided by experts engaged by each party is that the parties' experts might disagree about the likely operation or effect of coded terms. However, this challenge is not new. The courts of England and Wales are often confronted with disputes of a highly technical nature involving conflicting expert evidence. We understand that judges often address the issue by requiring the parties' experts to meet and seek agreement, to the greatest extent possible, on the answers to a series of questions put to them and approved by the court.

4.45 The court also has the power under section 70(1) of the Senior Courts Act 1981 to appoint an "assessor" to assist the court in dealing with a matter in which the assessor has skill and experience. The assessor may take such part in the proceedings as the court may direct. In particular, the court may direct the assessor to prepare a report on a matter in issue in the proceedings, or attend the whole or any part of the trial and advise the court on a matter in issue in the proceedings.[278] Where the court is asked to interpret the coded terms of a smart legal contract, the court could appoint an expert coder as an assessor, and the coder could provide assistance to the court on matters relevant to the interpretation of the coded terms.

4.46 The majority of consultees agreed that interpretation of a coded term should be determined by asking what the term would mean to a reasonable person with knowledge and understanding of code. Lloyd's of London said that it was "necessary to apply the standard of a reasonable person with knowledge of the relevant code in order to ensure a rational outcome". Similarly, Allen & Overy said the meaning of a coded term "should be determined by a reasonable person with knowledge of the relevant code". They said that such an approach "strikes the right balance", and is "consistent with the general principles of interpretation adopted by the English courts to date".

4.47 DLA Piper UK said that adopting this approach would not constitute a "material divergence from the current principles of interpretation", as courts "already have mechanisms in place to allow them to deal with, for example, foreign language terms". Clifford Chance said that the development of a "reasonable coder" test was "the most effective standard to evaluate the meaning of coded terms, and to further interpret whether a term performs according to the intended agreement". The Digital Law Association pointed out that:

> 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 was said to be a "legal conclusion which may require a solid conceptual understanding of the technical operation of the smart contract". The Digital Law Association thought this "may be achieved through the use of experts who are able to interpret and communicate the conceptual and practical objects of the code".

Conclusion on the appropriate test for interpreting coded terms

4.48 In our view, interpretation of a coded term should be determined by asking what the term would mean to a reasonable person with knowledge and understanding of code

[278] Civil Procedures Rules, r 35.15(3).

– that is, a "reasonable coder". The answer to this question will be determined by reference to what the code, in that person's reasoned opinion, appeared to instruct the computer to do.[279] In our view, this is the most appropriate way to ascertain the "meaning" of the coded terms of a smart legal contract.

4.49 In the call for evidence, we framed the test as knowledge and understanding of "the relevant code". By "relevant code" or "knowledge of code" we mean knowledge of the relevant programming language in question. The interpretative enquiry is then what the specific code in question means to a reasonable person with knowledge of that particular programming language (that is, to a "reasonable coder").

4.50 The "reasonable coder" test is premised on the fact that where code is a source of contractual rights and obligations, those rights and obligations accrue in the human-readable source code, rather than in machine code or a lower level of code that cannot be read by a human person. Where, however, the contractual terms accrue in the machine code or in a lower level of code that cannot be read by a human person, the reasonable coder test is unlikely to be suitable to ascertain the "meaning" of those terms. Since such code is unintelligible even to an expert coder, its "meaning" will have to be discovered by running it. In other words, the code simply "means" what it does when it is executed.

4.51 Whether the terms of a smart legal contract are defined by the source code, or by a lower level of code that cannot be read by a human person, raises an issue of interpretation. In most cases, we anticipate that where code is a source of contractual terms, those terms will be defined by the source code.[280] As the Digital Law Association said, where terms of a smart legal contract are defined by code, "it would almost certainly be the case that parties agree to the terms as they exist at the level of the source code". Even though we strongly agree with this, parties may wish to consider specifying that their terms reside in the source code to remove any potential uncertainty.

Benefits of the "reasonable coder" test

4.52 The "reasonable coder" test has the benefit of providing an insight into what the parties intended the code to do, regardless of the computer's ultimate performance. In focussing on the objective appearance of what the parties agreed to, such a test is more consistent with the existing approach to contractual interpretation than one that asks what the code meant to a functioning computer. The nature of computer code is such that its meaning to the machine to which it is addressed can be at odds with what the human authors of it believed it to mean. Observing the performance of the code, rather than asking what it was intended to do, is therefore of little relevance to the forensic question of what the parties actually agreed to.

---

279 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 36 for a similar view, and where the point is made that in interpreting a smart legal contract, the court will likely call upon experts to translate the smart legal contract into natural language. Reference is also made to artificial intelligence ("AI") systems assisting with interpreting smart legal contracts. Such AI systems could "supplement the experts capable of translating the code of smart contracts into natural language".

280 This approach is supported by the UKJT Legal Statement at [145].

4.53 We acknowledge that adopting a "reasonable coder" test entails a nuanced development of the existing principles of contractual interpretation. For the reasons given above, however, we think that such a development is necessary and justified in order to take account of the unique nature of contracts written in coded terms. Using professional knowledge and judgement as a benchmark for assessing human action is, in any event, not a practice unfamiliar to the law in this jurisdiction. In interpreting conventional contracts, courts are familiar with obtaining expert evidence in order to gain an understanding of technical terms.[281]

4.54 Ultimately, the exercise is still one of contractual construction. The ordinary rules of interpretation will suffice apart from the suggested incremental development to the test for interpreting coded terms – that is, asking what the coded terms mean to a reasonable coder. In addition, adopting a reasonable coder test does not mean that expert coders are required to provide an opinion on a matter of law; this ultimately remains within the exclusive purview of the courts.

Importance of context in the interpretative exercise

4.55 Interpretation is not determined in the abstract by reference to a set of semantic and syntactic rules. It is a more concrete enquiry, which looks not only at the literal meaning of words, but also at the context in which the speaker used those words. Since a computer will run code as instructed, limiting interpretation of code simply to observing the performance of that code would not give the court the opportunity to consider the context in which a coder used it. As DLA Piper UK put it, asking what a coded term "means" to a functioning computer would be to "discount context from the interpretation of coded terms", which would "not be appropriate". In contrast, interpreting coded terms according to what a reasonable person with knowledge and understanding of code would understand the terms to mean enables the court to consider the broader context.

4.56 A recent Supreme Court case, *Commissioners for Her Majesty's Revenue and Customs v Tooth ("Tooth")*,[282] confirmed the importance of context in the interpretative exercise, even where the document in question was to be read by a computer. This case concerned the interpretation of a tax return submitted by a taxpayer, Mr Tooth to Her Majesty's Revenue and Customs ("HMRC"). An issue in the case was whether Mr Tooth's tax return contained an "inaccuracy". Mr Tooth had incorrectly entered an employment loss as partnership loss in one of the boxes on the tax return form.[283] However, Mr Tooth explained this entry in a "white space" disclosure box included in the form to allow for written explanations.[284] Tax returns are read by HMRC's computers in the first instance.[285] Importantly, the computer could read the entries in the form, but not the information provided by the tax payer in the white space disclosure box. HMRC argued that, because Mr Tooth's tax return was read by a computer, it should be interpreted on an entry by entry basis, without regard to the

---

281 See, for example, *Baldwin & Francis Ltd v Patents Appeal Tribunal* [1959] AC 663, 684, by Lord Reid.

282 [2021] UKSC 17, [2021] 1 WLR 2811 ("*HMRC v Tooth*").

283 *HMRC v Tooth* at [3].

284 *HMRC v Tooth* at [9].

285 *HMRC v Tooth* at [35].

information provided in the white space disclosure box. It followed that Mr Tooth's tax return contained an inaccuracy. In contrast, Mr Tooth argued that each entry should be interpreted in the context of the tax return as a whole, including the white space disclosure box. On this approach, the tax return did not contain an inaccuracy.

4.57 The Court strongly rejected HMRC's argument.[286] It held that "it almost goes without saying" that the meaning of words is to be determined by a "contextual approach, that is, by appraising the critical passage in the light of its context as part of the document read as a whole".[287] HMRC's core argument was that, since the tax return was read by a computer (at least initially) contextual interpretation was not appropriate.[288] The Court said this was "a very unattractive argument".[289] It went on to say that:

> A document written in the English language (or any language other than computer language) does not have a different meaning depending upon whether it is read by a human being or by a computer. A choice by the recipient of such a document to have it machine-read cannot alter its meaning.[290]

4.58 This decision demonstrates that interpretation of a natural language document is always a contextual exercise, where the court looks at the words in the context of the document as a whole, and in light of the factual background. Importantly, though, *Tooth* is confined on its facts to natural language documents read by computers. The Court expressly carves out from its decision documents which are written in "computer language". The result of this carve out is that a document written in "computer language" (that is, in code) may "have a different meaning depending upon whether it is read by a human being or by a computer".[291]

4.59 We agree with this statement by the Court. If code is "read" by a computer, the meaning of the code could simply be what it does when it is executed. If code is read by a human being, the meaning of the code could be what a reasonable coder says the code appeared to instruct the computer to do. These two "meanings" may not always coincide. However, what we are concerned with is *which* meaning of code should be adopted. The argument put forward in this chapter is that the meaning of code should be what a reasonable coder says the code appeared to instruct the computer to do. That is, the meaning one comes to if the code is read by a human being. This approach has the benefit of providing an insight into what the parties intended the code to do, regardless of the computer's ultimate performance. By focussing on the objective appearance of what the parties agreed to, such a test is more consistent with the existing approach to contractual interpretation, the importance of which has recently been confirmed by the Supreme Court.

---

286 *HMRC v Tooth* at [49] to [52] by Lord Briggs and Lord Sales.

287 *HMRC v Tooth* at [49] by Lord Briggs and Lord Sales.

288 *HMRC v Tooth* at [49].

289 *HMRC v Tooth* at [50] by Lord Briggs and Lord Sales.

290 *HMRC v Tooth* at [50] by Lord Briggs and Lord Sales.

291 *HMRC v Tooth* at [50] by Lord Briggs and Lord Sales.

An example of how the "reasonable coder" test could be applied in practice

4.60 Suppose Alice and Bob conclude a solely code smart legal contract that is programmed to transfer 10 Ether from Bob to Alice every week until 1 January 2022. However, due to an unforeseen upgrade to the programming language,[292] the code transfers only five Ether to Alice in week three. The contract does not make any provision for the consequences of upgrades. Alice argues that Bob was unconditionally obliged to transfer 10 Ether to her each week until 1 January 2022. Bob disagrees; he says that he was only obliged to transfer 10 Ether to Alice each week in the event that the platform was operating normally, or that he was only required to transfer what the program actually transferred. In this case, a dispute could arise as to the scope of Bob's obligation, and the "meaning" of the coded terms. Alice argues that performance of the code did not accord with what the coded terms "meant" on their proper interpretation (which, according to her, was for Bob to unconditionally transfer 10 Ether) and, that performance of those terms amounts to a breach of contract by Bob. In the event of such a dispute, a reasonable coder would be asked which of these interpretations can be drawn from the content of the code.

4.61 Adopting this method of interpretation will illustrate any divergence between what the code appeared to instruct the computer to do (what we submit is its "meaning"), and what it did in fact do. It facilitates an argument that performance of the code was not in accordance with what the coded terms "meant" on their proper interpretation. In contrast, adopting a method of interpretation based on what the coded terms "mean" to a functioning computer would leave no scope for Alice to argue that performance of the coded terms was not in accordance with what those terms "meant"; the code would mean whatever the code performed.

NATURAL LANGUAGE AIDS TO INTERPRETING CODED TERMS

4.62 Natural language can be used in various ways to aid the court in understanding and interpreting the coded terms of a smart legal contract.[293]

(1) The parties could prepare a business process document or term sheet setting out in detail the terms of the transaction. A business process document is generally prepared in advance of the parties engaging a coder to draft the code, for use by the coder in writing the code. Such a document could also contain an explanation as to how the code works.

(2) The parties could set out expressly, in natural language, how they intend the code to operate. There are various forms that a natural language explanation of the code could take. For example, in the context of a hybrid smart legal contract, the natural language component could include terms setting out in detail how the code is intended to operate, or simply be a broad statement of intent. Alternatively, in the context of a solely code smart legal contract, the natural language explanation could be a separate document setting out how the

---

[292] Transpact said that an upgrade to a programming language may unintentionally cause the same computer program to run differently.

[293] We asked consultees if parties were using natural language to make their intentions clear in respect of any coded terms or the contract as a whole: call for evidence, question 28 at para 4.37.

code is intended to operate, agreed around the same time as the parties enter into the coded contract.

(3) The coder could include, within the code itself, comments to describe in natural language "the purpose of the code and any algorithms used to accomplish the purpose".[294]

4.63 We discuss each natural language aid below, and consider how the parties can ensure that the natural language element would be admissible if the court was asked to interpret the coded terms of a smart legal contract. As the Digital Law Association said, "laws governing the use of smart contracts may benefit from specifying what material may be admissible in this interpretation exercise (if any)".

Business process document

4.64 The parties to a smart legal contract may prepare a business process document or term sheet which sets out in detail the terms of the transaction. The document can then be handed over to a coder to translate into code, which constitutes the smart legal contract, and is signed by the parties. In such a case, where the code itself contains contractual terms which are intended to reflect the provisions of the business process document, the question that arises is whether the document (or "design script", as Clifford Chance put it) could be relied upon in interpreting the coded terms. In such a case, much will depend on whether the business process document has been agreed to by both parties, and is a legally binding contract.[295] If it is, then the business process document can be considered a concluded antecedent (or prior) agreement to the solely code contract. As a rule of interpretation, an antecedent agreement may be relied upon in interpreting a later agreement.[296] In the case of *Re BCA Pension Plan*, Snowden J said:

> It is also clear that earlier contractual documents (but not drafts produced in negotiation) can be used as part of the background to the construction of later documents.[297]

4.65 However, the usefulness of such a prior contract in interpreting the terms of a later contract will depend on the facts of the case. For example, if the parties have made it clear that the later contract is intended to supersede the prior contract, the provisions of the prior contract are unlikely to be relevant in interpreting the later contract. As

---

294 University of Utah School of Computing, "Commenting", https://www.cs.utah.edu/~germain/PPS/Topics/commenting.html. We anticipate comments in the source code to be included in the majority of cases, since it is good coding practice to do so, and such comments are useful tools for coders when reviewing the code to ensure it operates as the parties intend. If the coder is writing the code on the parties' instructions, we think those instructions can be taken to include the addition of comments that facilitate that drafting process. In addition, we can envisage a (fairly common) scenario in which the parties make clear that they want the coder to include such comments so as to assist with understanding how the code is intended to work in the event of a dispute.

295 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.24. See *Matchbet Ltd v Openbet Retail Ltd* [2013] EWHC 3067 (Ch) at [132] where Henderson J held that non-contractual heads of terms were not admissible in interpreting a subsequent agreement.

296 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.24; *HIH Casualty and General Insurance Ltd v New Hampshire Insurance Co & Ors* [2001] EWCA 735, [2001] 2 All ER 39.

297 [2015] EWHC 3492 (Ch), [2016] 4 WLR 5 at [21].

Lord Justice Rix said in *HIH Casualty and General Insurance Ltd v New Hampshire Insurance Co*:

> In principle it would seem to me that it is always admissible to look at prior contracts as part of the matrix or surrounding circumstances of a later contract. I do not see how the parol evidence rule can exclude prior contracts, as distinct from mere negotiations. The difficulty of course is that, where the later contract is intended to supersede the prior contract, it may in the generality of cases simply be useless to try to construe the later contract by reference to the earlier one. … Where, however, it is not even common ground that the later contract is intended to supersede the earlier contract, I do not see how it can ever be permissible to exclude reference to the earlier contract.[298]

4.66 Accordingly, the business process document can in principle be relied upon in interpreting the terms of the later, coded agreement. If, however, the business process document was intended to be superseded by the coded agreement, it will generally be irrelevant for the purposes of interpreting the latter. In addition, if the business process document is not a legally binding contract, it will be difficult to admit the document as an aid to interpreting coded terms.[299] In this case, the business process document is likely to be considered evidence of the parties' pre-contractual negotiations, which is inadmissible for the purposes of contractual interpretation.[300] To ensure a business process document is taken into account when interpreting coded terms, the parties could expressly incorporate by reference the terms of such a document into their coded agreement.

Natural language explanation of code

4.67 The parties to a smart legal contract could provide a natural language explanation as to how they intend the code to operate. As Herbert Smith Freehills said, the parties could include "useful aids to interpretation within the contract", which could include "process flows, diagrams, and potentially comments within the source code". The Digital Law Association explained that 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". Catherine Phillips noted that "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".

4.68 We think that where the smart legal contract contains coded terms, the parties would be well advised to provide a natural language explanation of the workings of the code in one or more of the ways mentioned by consultees. An understanding of the parties' intentions will be relevant in the event that the code performs in a way not expected or intended by the parties.

4.69 The question arises as to how and when such natural language explanation could be taken into account by a court faced with interpreting coded terms. This will depend on

---

298 [2001] EWCA 735, [2001] 2 All ER 39 at [83] to [84] by Rix LJ.

299 The business process document may still be relevant for the purposes of rectification. We discuss this in more detail in Chapter 5 (Remedies).

300 *Chartbrook Ltd v Persimmon Homes Ltd* [2009] UKHL 38, [2009] 1 AC 1101.

the nature and construction of the natural language explanation, and whether it forms part of the parties' contract. If it forms part of the contract itself, there is no issue in admitting such an explanation as an aid to interpreting the coded terms.

4.70 If the natural language explanation does not form part of the contract, it may still be relevant in interpreting the coded terms depending on how the court construes the explanation, and its structure. For example, if the natural language explanation is considered to be a document forming part of the same transaction as the coded agreement, it may be relied upon when interpreting the coded agreement. This is because a document executed contemporaneously with, or shortly after, the primary document, may be relied upon as an aid to construction of the primary document if it forms part of the same transaction.[301] Even though the "primary document" is, in this case, the coded agreement, we think that this rule of interpretation could be relied upon to assist with the admissibility of the explanatory document, where it forms part of the same transaction as the coded agreement.

4.71 In addition, the natural language explanation could be admissible in interpreting the coded terms on the basis that it forms part of the admissible background. This includes facts or circumstances that existed at the time the contract was made, and which were known or reasonably available to both parties.[302] In this case, however, the admissibility of such material is subject to the limitations associated with admitting background material, which includes that such material cannot be used to ascribe to the words of the contract a meaning that they cannot legitimately bear.[303] In addition, if any explanatory note constitutes evidence of the parties' subjective declarations of intent or previous negotiations, it will be inadmissible for the purposes of contractual interpretation.[304] This is because the courts of England and Wales take an objective approach to contractual interpretation; they do not ask what the parties themselves meant by the language they used.[305]

4.72 To ensure a natural language explanation of the code is taken into account when interpreting coded terms, the parties could expressly state that such explanation forms part of their legally binding agreement. Alternatively (where the natural language explanation is contained in a separate document) the parties could expressly incorporate by reference the terms of such a document into their coded agreement. In the latter case, even though the incorporated document does not itself have to have any contractual force, the terms of the incorporated document (in this case, the natural

---

301 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.06.

302 *Arnold v Britton* [2015] UKSC 36, [2015] 2 WLR 1593 at [17] by Lord Neuberger.

303 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.143; *Investors Compensation Scheme v West Bromwich Building Society* [1998] 1 WLR 896; *Bank of Credit and Commerce International SA v Ali* [2001] UKHL 8, [2002] 1 AC 251 at [39] by Lord Hoffmann.

304 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.42; *Arnold v Britton* [2015] UKSC 36, [2015] 2 WLR 1593 at [15] by Lord Neuberger; *Investors Compensation Scheme v West Bromwich Building Society* [1998] 1 WLR 896; *Chartbrook Homes Ltd v Persimmon Homes Ltd* [2009] UKHL 38, [2009] 1 AC 1101 at [40] by Lord Hoffmann. In the context of rectification, for the purposes of identifying the parties' actual common intention at the time of contracting, the court may have regard to evidence of the parties' prior negotiations. We discuss evidence of the parties' pre-contractual negotiations in the context of contractual interpretation from para 4.98.

305 See *Young v Brookes* [2008] EWCA Civ 816, [2008] 3 EGLR 27 at [12] by Rimer LJ.

language explanation of the code) must be capable of having contractual force.[306] In *Keeley v Fosroc International Ltd*, Lord Justice Auld said:

> On the question of construction … where a contract of employment expressly incorporates an instrument such as a collective agreement or staff handbook, it does not necessarily follow that all the provisions in that instrument or document are apt to be terms of the contract. For example, some provisions, read in their context, may be declarations of an aspiration or policy falling short of a contractual undertaking … . It is necessary to consider in their respective contexts the incorporating words and the provision in question incorporated by them.[307]

Provisions of an accompanying natural language explanatory document which purport to explain the workings of the code, but which are incapable of having contractual force (such as provisions that are too vague or aspirational), will not be incorporated by reference into the parties' agreement.

4.73 In *Investors Compensation Scheme v West Bromwich Building Society ("Investors Compensation Scheme")*, the Court looked at an external explanatory note to interpret the terms of the main document.[308] The investors in that case (who had suffered losses in respect of ill-advised investments) lodged claims for compensation with the Investors Compensation Scheme (the "scheme"). The scheme's claim form required the investors to assign to the scheme all of their rights arising out of the transaction against the financial advisers, subject to a reservation of certain rights against the building society who provided the relevant mortgage. The scheme brought proceedings against various building societies, claiming to sue as assignee of the investors. The question that arose was whether the reservation of rights meant that there had been a valid assignment of the investors' rights against the building societies to the scheme. Since the claim form referred to technical concepts, and was not easy to understand, the scheme provided an explanatory note which contained further details of the investors' rights to sue and of the assignment. The explanatory notes were said to be relevant in construing the relevant provision of the claim form.[309] Lord Hoffmann said:

> First, the claim form was obviously intended to be read by lawyers and the explanatory note by laymen. It is the terms of the claim form which govern the legal relationship between the parties. But in construing the form, I think that one should start with the assumption that a layman who read the explanatory note and did not venture into the claim form itself was being given an accurate account of the effect of the transaction.

Similarly, where investors subscribed to an investment scheme set out in detail in a brochure, the brochure was admissible in construing the contract.[310] In *Matthew Hall*

---

306 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.81.

307 [2006] EWCA Civ 1277, [2006] IRLR 961 at [31] by Auld LJ.

308 [1998] 1 WLR 896.

309 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.38.

310 *R v Clowes (No.2)* [1994] 2 All ER 316.

Ortech Ltd v Tarmac Roadstone Ltd,[311] guidance notes prepared to assist with the drafting of a standard form engineering contract were relevant in interpreting the contract.[312]

4.74 This rule of interpretation is said to apply to "published" explanatory notes which are generally made available to members of the public who have contracted with the relevant service provider.[313] An example in the smart contract context would be where the developer of a solely code smart legal contract (which multiple participants of the network are free to interact with) publishes a description as to how the code is intended to operate on the platform. In this case, we think it is possible to draw an analogy between the natural language explanation of the code, and the explanatory note found in *Investors Compensation Scheme*. In both cases, the purpose of the document is to provide "an accurate account of the effect of the transaction" to contracting parties,[314] and to assist the court in construing the objective meaning of the terms. Similarly, any technical specifications or process documents could be considered explanatory notes in the context of this rule of interpretation. As Transpact said, "the technical specification of the coding language itself, as specified by the platform, is also key to code interpretation".

Natural language comments in source code

4.75 In Chapter 2, we explain that good coding practice requires that code include natural language comments. [315] We also make the point that such comments could be used to define or express contractual terms. Whether such comments do constitute contractual terms will be a matter of contractual interpretation and construction. To avoid any uncertainty or ambiguity, parties would be well advised to make clear the status of any comments in code, and whether such comments form part of the parties' contract. As Herbert Smith Freehills said:

> 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 [into account] when interpreting the contract (or a particular term).

4.76 Where the comments in the code constitute contractual terms, such comments will be relevant to the interpretation of the smart legal contract as a whole as they form part of the contract. If a dispute were to arise as to the meaning of the coded terms in particular, the meaning of the terms embodied in the comments in the code would be relevant to the court's interpretation of the coded terms in dispute. This is because the courts of England and Wales interpret the terms of the contract in the context of the contract as a whole.

4.77 If the comments in the code do not constitute contractual terms, we think such comments could still be admissible as a useful aid to interpreting the coded terms of

---

311 (1997) 87 BLR 96.

312 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.38.

313 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.37.

314 *Investors Compensation Scheme v West Bromwich Building Society* [1998] 1 WLR 896 by Lord Hoffmann.

315 We discuss comments in code from para 2.7 and at para 2.51(2).

the smart legal contract. For example, where the comments in the code explain what a single line of code will do, we think an analogy could be drawn with headings in traditional contracts. Unless the contract stipulates otherwise, headings are generally taken into account in construing the meaning of a particular clause, but they cannot override clear language or create an ambiguity where, but for the heading, none would otherwise exist.[316]

4.78 Where the comments in the code are more akin to ”block comments” or “section comments” (which explain what a particular block or section of the code is intended to do) we think an analogy could be drawn with recitals or background provisions in a traditional contract. In this regard, recitals are generally considered (in the absence of a specification to the contrary) to form part of the admissible background. This includes facts or circumstances that existed at the time that the contract was made, and which were known or reasonably available to both parties.[317]

4.79 Just as recitals are relevant to interpreting the terms of a traditional contract, so can block or section comments in the code be equally relevant to interpreting the coded terms of a smart legal contract. However, as with recitals, natural language comments in the code are only likely to be admissible where the meaning of the coded terms is unclear,[318] unless they are specifically said to be part of the binding agreement. In addition, in the case of an inconsistency between any natural language comments and the coded terms, the latter would prevail.[319]

4.80 If, however, any natural language comments constitute evidence of the parties' subjective declarations of intent or pre-contractual negotiations, they will be inadmissible for the purposes of contractual interpretation.[320] To ensure that natural language comments in the code are taken into account when interpreting coded terms the parties could, for example, expressly state that such comments form part of their legally binding agreement.

IMPLIED TERMS

4.81 Under the law of England and Wales, terms may be implied into a contract in one of three ways. First, a term may be implied in fact where the term is so obvious that it “goes without saying”, or where it is necessary to give “business efficacy” to the contract.[321] Likewise, the court may imply a term in law if it is required by the type of

316 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 5.107.

317 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 10.51; *Arnold v Britton* [2015] UKSC 36, [2015] 2 WLR 1593 at [15] by Lord Neuberger.

318 *Ex p Dawes, Re Moon* [1886] 17 QBD 275, 286, Lord Esher MR.

319 *Ex p Dawes, Re Moon* [1886] 17 QBD 275, 286, Lord Esher MR.

320 K Lewison, *The Interpretation of Contracts* (7th ed 2020) para 3.42; *Arnold v Britton* [2015] UKSC 36, [2015] 2 WLR 1593 at [15] by Lord Neuberger; *Investors Compensation Scheme v West Bromwich Building Society* [1998] 1 WLR 896; *Chartbrook Homes Ltd v Persimmon Homes Ltd* [2009] UKHL 38, [2009] 1 AC 1101 at [40] by Lord Hoffmann.

321 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 93; *Ali v Petroleum Company of Trinidad and Tobago* [2017] UKPC 2, [2017] ICR 531 at [5] by Lord Hughes.

contract or relationship in question.[322] For example, in employment contracts, there is generally an implied term as to mutual trust and confidence.[323] Any term implied by the court must be sufficiently precise and must not contradict any express terms.[324]

4.82 Second, terms may be implied (whether by fact or law) into a contract based on the custom or practice of the relevant trade, market, or locality.[325] In *Cunliffe-Owen v Teather & Greenwood*, the Court found that stock exchange rules had been included in the contract through customary trade usage.[326] To be binding, such terms have to be notorious, certain and reasonable, and not contrary to law.[327]

4.83 Third, terms may be implied by legislation which may, depending on the statute's policy goals, override express contractual terms.[328] For example, section 14(1) of the Sale of Goods Act 1979 excludes all other implied terms as to quality or fitness of goods supplied under a contract of sale, unless they are mentioned in sections 14 and 15 of the Act.

Implied terms in the context of smart legal contracts

4.84 In the first instance, we think that the existing principles of implied terms can (and should) apply to smart legal contracts in much the same way as they do to traditional contracts.[329] As Professor Hugh Beale said, "there will be gaps where the parties just haven't anticipated what happened". Professor Beale agreed that any issues that arise in this regard "would have to be solved in the same way [as with traditional contracts]". Herbert Smith Freehills said that disputes about the coded terms of a smart legal contract may arise where "one party claims that an implied term conflicts with a coded term", or where the code does not constitute a contractual term but is rather a method of performing an implied term.

4.85 Having said that, in our view, it is likely that certain types of implied terms may be less relevant in the smart legal contract context, or particularly difficult to establish. For example, in a traditional contract, the court may imply a term to the effect that the parties shall cooperate to ensure the performance of their bargain.[330] This term may

---

322 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 93; *Société Générale, London Branch v Geys* [2012] UKSC 63, [2013] 1 AC 523 at [55] by Lady Hale; *Scally v Southern Health and Social Services Board* [1992] 1 AC 294, 306 to 307, by Lord Bridge of Harwich.

323 *Malik v Bank of Credit and Commerce International SA* [1998] AC 20, 34, by Lord Nicholls of Birkenhead. Also see H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 16-030, which notes that contracts of employment generally contain a term that the employer will not do anything that would damage or risk damaging the relationship of trust and confidence between the employer and employee.

324 *Marks and Spencer Plc v BNP Paribas Securities Services Trust Co (Jersey) Ltd* [2015] UKSC 72, [2016] AC 742 at [28] by Lord Neuberger.

325 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 93.

326 [1967] 1 WLR 1421.

327 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 16-035.

328 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 93.

329 See L DiMatteo, M Cannarsa and C Poncibò, "Smart Contracts and Contract Law" in L DiMatteo, M Cannarsa and C Poncibò (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms* (2019) p 10 for a similar view.

330 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 16-026.

be implied when both parties agree to do something, but it cannot "effectively be done unless both concur in doing it".[331] If a term as to cooperation is implied, the court may also determine the degree of cooperation required between the parties.[332]

4.86 Given the automaticity of performance of smart legal contracts, it may be said that "trust and cooperation are neither required nor nurtured".[333] As such, an implied term as to cooperation between the parties is less likely to be required in a smart legal contract context. The code will perform regardless of the parties' intentions, and such a term is therefore less likely to be necessary to make the smart legal contract "work".[334] Courts and tribunals may therefore need to consider a novel set of implied terms specifically for smart legal contracts. For example, it has been suggested that terms may be implied into consumer algorithmic contracts to protect consumer privacy.[335]

4.87 In addition, where the parties have defined part or all of the terms of their smart legal contract in code, it might be especially difficult to establish an implied term. Professor Hugh Beale provided the example of an implied term relieving a party from performance where "an oracle suddenly starts supplying false data". In the context of a solely code smart legal contract, a term that relieves a party from performance where an oracle supplies false data is likely to be considered reasonable, but reasonability is not the relevant threshold for finding an implied term.[336] As Lord Neuberger has said in the Supreme Court, a term should not be implied "merely because it appears fair or merely because one considers that the parties would have agreed it if it had been suggested to them".[337]

4.88 The term can only be implied "if, without the term, the contract would lack commercial or practical coherence".[338] It is difficult to see how a solely code smart legal contract could be said to "lack commercial or practical coherence" without a term that relieves a party from performance where an oracle supplies false data. By its very nature, the behaviour of the code is likely to be a strong indicator that the agreement is coherent and complete. In addition, even though the exercises of interpretation and implying terms "are different processes governed by different rules",[339] they are interconnected

---

331 *Mackay v Dick* [1881] UKHL 387, [1881] 6 AC 251, 263, by Lord Blackburn.

332 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 16-026.

333 S Green, "Smart contracts, interpretation and rectification" (2018) 24 *Lloyd's Maritime and Commercial Law Quarterly* 234, 245.

334 *Marks and Spencer Plc v BNP Paribas Securities Services Trust Co (Jersey) Ltd* [2015] UKSC 72, [2016] AC 742 at [77] by Lord Clarke.

335 LH Scholz, "Algorithmic Contracts and Consumer Privacy" in L DiMatteo, M Cannarsa and C Poncibò (eds), *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms* (2019) p 268.

336 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 95.

337 *Marks and Spencer Plc v BNP Paribas Securities Services Trust Co (Jersey) Ltd* [2015] UKSC 72, [2016] AC 742 at [21].

338 *Marks and Spencer Plc v BNP Paribas Securities Services Trust Co (Jersey) Ltd* [2015] UKSC 72, [2016] AC 742 at [21] by Lord Neuberger.

339 *Marks and Spencer Plc v BNP Paribas Securities Services Trust Co (Jersey) Ltd* [2015] UKSC 72, [2016] AC 742 at [26] by Lord Neuberger.

enquiries.[340] Difficulties in interpreting coded terms could therefore flow over to, and exacerbate, the difficulties associated with implying terms in the same context.

4.89 However, where a case for an implied term is made out, the fact that the parties have chosen to express (certain or all) of their contractual terms in code should not, in our view, mean that a court can only imply a term in code. We do not think the presence of coded terms prevents a court from implying a natural language term, if it would be appropriate to do so. To hold otherwise would, in our view, be unduly restrictive.

4.90 In sum, given that the courts adopt a restrictive approach to implying terms,[341] the parties will have to overcome a high threshold in order to persuade the court to imply a term into their smart legal contract, particularly where coded terms are present. Even though establishing an implied term may be more difficult where coded terms are present, such difficulties arise primarily from the application of existing principles to new factual scenarios, rather than from deficiencies in the existing principles of implied terms.

IS THE COURTS' CURRENT APPROACH TO INTERPRETATION PROBLEMATIC?

4.91 As set out above, we consider that the courts' current approach to contractual interpretation is sufficiently flexible so as to accommodate smart legal contracts. At this stage, we have not identified any need for reform (other than a limited development to the common law in relation to the test for interpreting coded terms).[342]

4.92 The majority of consultees agreed that the courts' current approach to contractual interpretation would not cause problems in the context of smart legal contracts.[343] The Digital Law Association expected existing principles and approaches to be "broadly appropriate, with some adaptations on the practical level, rather than the conceptual". DLA Piper UK noted that, in resolving interpretation disputes in the context of smart legal contracts:

> 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.

4.93 This reflects our approach, and the general approach of law reform in this jurisdiction, particularly in relation to emerging technologies where legislation may stifle innovation, or become quickly outdated. Stephan Smoktunowicz said that the courts' current approach to contractual interpretation will not cause problems so long as there are sufficiently "experienced subject matter experts" to assist the court in the interpretative exercise. We agree that having sufficiently skilled and experienced subject matter experts to assist the court in interpreting coded terms will be

---

340 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 96.

341 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 95.

342 Discussed from para 4.40.

343 We asked consultees if they thought that the courts' current approach to contractual interpretation might cause problems in the context of smart legal contracts: call for evidence, question 30 at para 4.45. We also asked consultees to provide examples or evidence of this occurring.

necessary. This is particularly so given that the test we propose for interpreting coded terms (what the coded term would mean to a reasonable person with knowledge and understanding of code) entails an increased reliance on expert coders. In other words, while we agree with the substance of the response, we think it is the proposed test to interpreting coded terms (rather than the existing test) that will not be problematic provided there are sufficiently "experienced subject matter experts" to assist the court.

4.94 Consultees who thought that the courts' current approach to interpretation might cause problems in the context of smart legal contracts said it should be possible to admit a greater range of materials to aid in interpreting smart legal contracts.

4.95 Katherine Graff thought that "everything should be used to aid interpretation here rather than just terms of the contract", but the existing law does not currently permit this. Similarly, Florian Idelberger said that courts should adopt a more "holistic" approach to interpretation (such as considering marketing documentation and other documents that might evidence the parties' intentions).

4.96 Earlier in this chapter, we explain that various natural language materials may be admissible to interpreting coded terms,[344] depending on their nature, and how the parties have characterised those materials. In the context of smart legal contracts, it is particularly important that parties consider what materials make up "the contract", especially given the potential complexities involved with interpreting coded terms, and in determining what takes priority in the event of a conflict between terms. We consider that there is already considerable flexibility in the current rules such that general reform is not required.

4.97 However, some consultees suggested that pre-contractual negotiations should be admitted to assist with interpreting smart legal contracts. Evidence of the parties' prior negotiations as to the meaning of the words used is not admissible,[345] and would therefore require a change in the law. We consider this possibility below.

Evidence of the parties' pre-contractual negotiations

4.98 Admitting evidence of the parties' pre-contractual negotiations is generally thought to be unhelpful because what the parties did and said in their negotiations may not reflect the final position they took when they entered into the contract.[346] There is also a concern that admitting such evidence would prejudice the interests of third parties who have relied on the meaning of the contract as written, and who were not privy to the parties' negotiations.[347]

---

344 We discuss the natural language aids to interpreting coded terms from para 4.62.

345 *Chartbrook Ltd v Persimmon Homes Ltd* [2009] UKHL 38, [2009] 1 AC 1101.

346 *Prenn v Simmonds* [1971] 1 WLR 1381, 1384, by Lord Wilberforce.

347 *Chartbrook Homes Ltd v Persimmon Homes Ltd* [2009] UKHL 38, [2009] 1 AC 1101 at [40] by Lord Hoffmann.

4.99 There was generally an even split in terms of the number of consultees (expressly or implicitly) in favour of admitting pre-contractual negotiations, and those against.[348]

4.100 Consultees who were in favour of such an approach provided examples of when courts should be able to consider evidence of the parties' pre-contractual negotiations as an aid to interpreting smart legal contracts. Slaughter and May said that where the smart legal contract is a solely code contract, "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". This was said to be necessary because "reviewing these interactions could provide the court with better insight into what the parties intended the code to do". They also said that "the risk that such negotiations may not reflect the final position the parties took when they entered the contract is greatly attenuated". Catherine Phillips thought that evidence of the parties' pre-contractual negotiations should be permitted "where the terms of the contract are not clear". Florian Idelberger said "pre-contractual negotiations and communications should always be used to interpret the contract and any preceding offer and acceptance" where there are "significant discrepancies".

4.101 Several consultees were of the view that admitting pre-contractual negotiations as an aid to the interpretation of smart legal contracts should never be permitted, and that there was no case for applying different rules to smart legal contracts compared to traditional contracts. Herbert Smith Freehills said that "the usual exclusionary rule should be preserved for coded terms of smart contracts", as the existing approach "promotes certainty and diligence in drafting and instructing coders". Linklaters likewise "strongly advised 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". Similarly, the Chancery Bar Association and Commercial Bar Association (joint response) thought that evidence of the parties' pre-contractual negotiations should be considered under "no circumstances". This was said to be because:

> Permitting evidence of the parties' pre-contractual negotiations as an aid to interpretation of the coded 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.

4.102 After considering consultee responses, we do not think it is necessary or desirable to admit evidence of the parties' pre-contractual negotiations to assist in the interpretation of the coded terms of a smart legal contract. Given that admitting pre-contractual negotiations as an aid to interpretation would involve a reform of the law, we do not think there is sufficient support to justify proposing it. Reforming the law in this way would create an unprincipled distinction between the courts' approach to

---

[348] We asked consultees under what (if any) circumstances courts should be able to consider evidence of the parties' pre-contractual negotiations as an aid to interpretation of the coded terms of a smart legal contract: call for evidence, question 29 at para 4.43.

interpreting traditional contracts, and their approach to interpreting smart legal contracts. We do not think there is sufficient justification for proposing a special rule for smart legal contracts in this context. Furthermore, there are already various natural language aids to interpreting coded terms that can be relied on. As discussed above, these include natural language explanations of the code, business process documents and natural language comments in the code. We consider that parties, when developing their smart legal contract, should give active consideration to the status that should be attributed to such materials.

Steps the court could take to resolve disputes about coded terms

4.103 In the call for evidence, we asked consultees what practical or procedural steps a court could take to resolve disputes about the interpretation of the coded terms of a smart legal contract.[349] Several consultees said that training members of the judiciary on code and smart contract technology would greatly assist in interpreting coded terms. DLA Piper UK advocated training "selected members of the judiciary", as it would be "beneficial to have a pool of judges" who are familiar with the issues raised by smart legal contracts, and who regularly deal with such cases. Relatedly, D2 Legal Technology suggested the creation of "specialised courts and tribunals" specifically designated to deal with such disputes.[350]

4.104 Clifford Chance proposed interpreting coded terms according to "a customary lexicon" (that is, interpreting the terms based on industry standard terminology). However, as Clifford Chance pointed out, the shortcoming with this approach is that it is premised on the idea that "all parties to the contract would have understood the meaning to be the same", which may not always be the case.

4.105 Several consultees emphasised the importance of expert coders and witnesses in resolving disputes about coded terms. The Society of Licensed Conveyancers said that, even though the current procedural steps utilised by the courts "would be suitable", there may be an additional need for "expert advice in relation to the interpretation of coded terms". Similarly, Herbert Smith Freehills thought that the courts will most likely need to call on the assistance of a person familiar with how the code operates, "which may help with formulating a view on the intention behind a clause".

4.106 Many of today's lawyers and judges already have developing expertise in smart legal contracts and their associated technologies, whether through direct experience or as a result of specific training. In addition, it is increasingly common for technologists to work alongside lawyers and to play an integral role within the justice system. The responses to our call for evidence indicate that this trajectory is set only to continue, not least as a response to the continued growth in the use and adoption of smart legal contracts. Industry standardisation and the work of bodies such as LawtechUK will

---

349 Call for evidence, question 27 at para 4.32.

350 See T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 37 for a similar view, and where the point is made that judges could embark on training programs to learn various programming languages and "computational thinking basics". In addition, reference is made to "specialised technology chambers" to deal with smart legal contract disputes.

further accelerate the considerable progress made in this area in recent years. We hope, too, that this paper will itself provide assistance to those who wish to draw on it.

Chapter 5: Remedies

5.1 Various problems can arise in the life cycle of a contract, and in response to these problems, the law provides a range of remedies. This chapter discusses the problems that might arise in the context of smart legal contracts, the remedies that the parties to such contracts might seek, and how a court might award those remedies in practice.

5.2 It is often said that smart legal contracts dramatically reduce the possibility of breach of contract. In a traditional contract, since performance of the contract usually depends directly on human beings, there is always the possibility that one of the parties might perform its obligations defectively, or refuse to perform them at all. In contrast, in a smart legal contract, the code will execute automatically when the conditions for its execution are met. For this reason, the performance of smart legal contracts is often said to be "guaranteed".[351] Even so, we think it would be premature to conclude that contractual remedies are of minimal relevance to smart legal contracts. In particular, although smart legal contracts are likely to reduce the incidence of non-performance, that is not necessarily the same as reducing or removing instances of breach of contract for defective performance. In fact, we think smart legal contracts may actually increase instances of defective performance, given the scope for the code to perform in ways the parties did not expect or intend.

5.3 In particular, this chapter discusses:

(1) how the law on rectification might be applied to smart legal contracts, and the practical difficulties that might arise when rectifying code;

(2) how the law on the vitiating factors of mistake, misrepresentation, duress and undue influence might be applied to smart legal contracts, and the remedies that might be awarded if a smart legal contract is void or set aside because of a vitiating factor;

(3) how problems with the performance of a smart legal contract could be remedied, including through an award of damages or an order of specific performance;

(4) how the law on frustration might be applied to smart legal contracts; and

(5) how principles of illegality might be applied to smart legal contracts.

---

[351] See for example T Cutts, "Smart Contracts and Consumers" (2019) 122 *West Virginia Law Review* 389; O Meyer, "Stopping the unstoppable – termination and unwinding of smart contracts" (2020) *Journal of European Consumer and Market Law* 15; M Durovic and A Janssen, "Formation of smart contracts under contract law" in L DiMatteo, M Cannarsa and C Poncibò (eds), *Smart contracts, blockchain technology and digital platforms* (2020) p 71.

RECTIFICATION

Overview

5.4 Rectification is a remedy by which the court orders the terms of a written contract to be amended so that they are consistent with what the parties have agreed.[352] Since rectification is an equitable remedy, the court has a discretion to refuse to grant rectification.[353] For example, the court may refuse to order rectification if doing so would prejudice the interests of innocent third parties.[354] In addition, rectification will only be ordered where there is a dispute or live issue between the parties; if rectification will not serve any practical purpose, it will not be ordered.[355] There are three circumstances where the court may order rectification of a written contract.

(1) Where the written contract is intended by the parties to give effect to the terms of a prior contract, but the written contract, by mistake, fails to give effect to the terms of the prior contract. Here, the court may rectify the written contract so that it gives effect to the prior contract.[356]

(2) Where the parties enter into a written contract but, by mistake, the contract is inconsistent with the actual common intention that was held by the parties at the time the contract was made. Here, the court may rectify the written contract so that its terms are consistent with that actual common intention.[357]

(3) Where the parties enter into a written contract, the terms of which are inconsistent with the actual intention that was held by one of the parties, to the knowledge of the other party, at the time the contract was made. Here, the court may rectify the written contract so that it is consistent with what the mistaken party actually intended at the time the contract was made.[358]

5.5 In considering how these legal principles might apply to smart legal contracts, it is important to distinguish between the different forms a smart legal contract can take. As noted in Chapter 2, one form of smart legal contract is a natural language contract with automated performance by code. These smart legal contracts do not give rise to

---

352 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-057; C Mitchell, P Mitchell, S Watterson (eds), *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 40-32.

353 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-100.

354 See *Bell v Cundall* (1750) Amb 101; *Smith v Jones* [1954] 1 WLR 1089; *Lyme Valley Squash Club Ltd v Newcastle-under-Lyme BC* [1985] 2 All ER 405, 413.

355 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-098.

356 *FSHC Group Holdings Ltd v GLAS Trust Corp Ltd* [2019] EWCA Civ 1361, [2020] Ch 365 at [176] by Leggatt LJ.

357 *FSHC Group Holdings Ltd v GLAS Trust Corp Ltd* [2019] EWCA Civ 1361, [2020] Ch 365 at [176] by Leggatt LJ.

358 *FSHC Group Holdings Ltd v GLAS Trust Corp Ltd* [2019] EWCA Civ 1361, [2020] Ch 365 at [103] to [104] by Leggatt LJ.

novel legal issues concerning rectification because the code is merely a tool for implementing the terms of a natural language contract.[359]

5.6 However, the other forms of smart legal contract could give rise to novel legal issues in a claim for rectification.[360] Where the smart legal contract takes the form of a hybrid contract or a solely code contract, a party might seek rectification of the coded terms of the contract. Below we discuss how the law on rectification might be applied where a party seeks rectification of coded terms, and identify potential practical difficulties that may arise when rectifying code.

Where the code fails to reflect the terms of a prior natural language contract

5.7 The first category of rectification concerns cases where the parties intend the written contract to reflect the terms of a prior contract but, by a mistake such as a drafting error, the written contract fails to do so.[361] This category of rectification has a narrow scope, and is rarely claimed in the context of traditional contracts.[362] However, it may arise more frequently in the context of smart legal contracts. This is because the practice of smart legal contracting may involve the parties first concluding a contract in natural language (for example, a business process document) which sets out the terms of the transaction. The natural language contract is then handed over to a coder to translate into code. Where the code itself contains contractual terms which are intended to reflect the terms of the natural language contract, the code may be rectified if it fails to reflect those natural language terms.[363]

Where the code fails to reflect the parties' common intention

5.8 The second category of rectification concerns the situation where the parties have concluded a standalone written contract,[364] but that contract inaccurately records the common intention held by the parties at the time the contract was made. By "common intention" what is meant is the actual – that is, subjective – intention shared by the parties at the time of entry into the contract.[365] It is not sufficient that the parties independently held intentions that happened to coincide at the point of entry into the

---

359 However, the failure of the code to perform the natural language contract in accordance with its terms may give rise to a claim for breach of contract. We discuss this further from para 5.112.

360 In Chapter 3 from para 3.83, we make the point that it is arguable that a contract recorded in source code is "in writing". In principle, therefore, the remedy of rectification might be available in respect of the coded terms of a smart legal contract where those coded terms are said to record inaccurately the parties' agreement. See also the UKJT Legal Statement at [154].

361 Rectification will not be ordered where there is evidence that the parties intended the written contract to vary or supersede the terms of the prior contract: see *PT Berlian Laju Tanker TBK v Nuse Shipping Ltd (The Aktor)* [2008] EWHC 1330 (Comm), [2008] 2 Lloyd's Rep 246 at [60] to [61] by Clarke J.

362 For an example, see *Milton Keynes BC v Viridor (Community Recycling MK) Ltd* [2017] EWHC 239 (TCC), [2017] BLR 216.

363 If the code does not contain contractual terms, but is merely a tool used by the parties to automate the performance of their obligations under the natural language contract, then the code cannot be subject to an order of rectification. Practical difficulties in rectifying code are discussed from para 5.14.

364 That is, a contract which is not intended by the parties to give effect to the terms of a prior contract.

365 *FSHC Group Holdings Ltd v GLAS Trust Corp Ltd* [2019] EWCA Civ 1361, [2020] Ch 365 at [176] by Leggatt LJ.

contract.[366] Rather, the shared intention must have been the subject of an "outward expression of accord" between the parties, meaning that, "as a result of communication between them, the parties understood each other to share that intention".[367]

5.9 For the purposes of identifying the parties' actual common intention at the time of contracting, the court may have regard to evidence of the parties' prior negotiations.[368] Where this common intention is proven, and the terms of the written contract are inconsistent with it, the court may order rectification of the written contract to remove the inconsistency.[369] The justification for this is that it would be contrary to the principle of good faith for a party to enforce a contract which it knows is inconsistent with the bargain both parties believed they were making when they entered the contract.[370]

5.10 Rectification based on common intention may be a relevant remedy in the context of smart legal contracts. The parties may first settle the terms of their bargain in natural language negotiations, and then translate that bargain into code by enlisting the services of a coder. This process of translating a bargain from natural language into code creates a risk that the code will fail correctly to reflect the parties' intentions. As discussed in Chapter 4, evidence of the subjective intentions of the parties (including evidence of their prior negotiations) as to the meaning of the words used is not admissible.[371] As such, mistakes in translation may be difficult to address by applying the principles of interpretation to the coded terms. However, where it can be shown that the code is inconsistent with the parties' actual common intention at the time of contracting, rectification might be available to amend the code.

5.11 Consider the following example:[372] suppose Alice and Bob negotiate a transaction and decide to effect it through a solely code smart legal contract. They provide a computer coder with a document that sets out the terms of the transaction, but which is not contractually binding. Based on this document, the coder drafts the code, which is then deployed on a distributed ledger. However, unbeknownst to Alice and Bob, the coder makes an error and the pricing formula, which dictates how much Bob is required to pay Alice, is inaccurately recorded.[373] This error happens to work to Bob's

---

366 *FSHC Group Holdings Ltd v GLAS Trust Corp Ltd* [2019] EWCA Civ 1361, [2020] Ch 365 at [77] by Leggatt LJ.

367 *FSHC Group Holdings Ltd v GLAS Trust Corp Ltd* [2019] EWCA Civ 1361, [2020] Ch 365 at [176] by Leggatt LJ.

368 *Investors Compensation Scheme v West Bromwich Building Society* [1998] 1 WLR 896 by Lord Hoffmann; *Chartbrook Ltd v Persimmon Homes Ltd* [2009] UKHL 38, [2009] 1 AC 1101 at [64] to [67].

369 *FSHC Group Holdings Ltd v GLAS Trust Corp Ltd* [2019] EWCA Civ 1361, [1998] 1 WLR 896 at [46] by Leggatt LJ (noting that "convincing proof" of the parties' common intention is required, given the "natural presumption that the written contract is an accurate record of what the parties agreed").

370 *FSHC Group Holdings Ltd v GLAS Trust Corp Ltd* [2019] EWCA Civ 1361, [1998] 1 WLR 896 at [55] by Leggatt LJ.

371 *Chartbrook Ltd v Persimmon Homes Ltd* [2009] UKHL 38, [2009] 1 AC 1101. We discuss this further from para 4.98.

372 We also used this example in the call for evidence, at para 5.16.

373 The coder may be liable under a separate contract with the parties, or potentially in negligence: see Tech London Advocates, *Blockchain: Legal & Regulatory Guidance* (2020) p 40.

advantage. Alice subsequently discovers the error, and claims rectification. In principle, rectification might be available in this scenario. The document provided to the coder is likely to provide strong evidence of the parties' subjective common intention at the time they concluded the smart legal contract. As the code is inconsistent with that subjective common intention, the court could order the code to be rectified.

Where the code fails to reflect one of the parties' intentions

5.12 The third category of rectification concerns the situation where one of the parties was mistaken about the terms of the written contract, to the other party's knowledge, when the contract was made. The court may order rectification on the basis that it would be contrary to good faith for a party to enforce a contract which it knew was inconsistent with the bargain that the other party believed was being made at the time of entry into the contract.[374] Returning to the example in paragraph 5.11 above, Alice could send the code to Bob for review, stating that she has received assurances from her coder that the code reflects the terms of the document. Bob's coder notices that the pricing formula is inaccurately recorded, and informs Bob. Bob, however, realising that the erroneous pricing formula works to his advantage, does not tell Alice. In principle, Alice may have a claim to rectification in this scenario on the basis that she was mistaken about the terms of the code, and Bob knew this at the time the contract was made.

5.13 The requirement that the claimant's mistake must have been known to the defendant has been justified on the basis that this kind of rectification is said to be a drastic remedy. This is because it has the effect of imposing on the non-mistaken party a contract which that party did not, and did not intend to make.[375] It has been suggested that "sharp practice" by the non-mistaken party, in addition to actual knowledge of the mistake, might be necessary for rectification to be ordered in these circumstances.[376] In this scenario, as Bob deliberately refrained from informing Alice of her mistake for his own commercial advantage, a court may take the view that it would be inequitable to allow Bob to insist on the binding force of the contract.[377] Rectification, in accordance with Alice's understanding of the code, may therefore be justified.

Practical difficulties in rectifying code

5.14 The above discussion suggests that a court could make an order for rectification to amend the coded terms of a smart legal contract in a variety of circumstances.

---

374 *FSHC Group Holdings Ltd v GLAS Trust Corp Ltd* [2019] EWCA Civ 1361, [1998] 1 WLR 896 at [105].

375 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-078; *George Wimpey UK Ltd v VI Construction Ltd* [2005] EWCA Civ 77 at [65] by Sedley LJ (noting that rectification for unilateral mistake is a "drastic" remedy as it imposes a contract on the defendant that they did not intend to make); A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 191. See also H Beale (ed), *Chitty on Contracts* (34th ed 2021) at para 5-078 fn 386 where the point is made that rectification for unilateral mistake is often said to be a "drastic remedy" without reference to the fact that, in the classic case of unilateral mistake known to the defendant, to refuse rectification would be equally harsh on the claimant.

376 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-074; *Thomas Bates Ltd v Wyndham's (Lingerie) Ltd* [1981] 1 WLR 505, 515, by Buckley LJ, 522, by Brightman LJ.

377 *Riverlate Properties Ltd v Paul* [1955] Ch 133, 140; *Littman v Aspen Oil (Broking) Ltd* [2005] EWCA Civ 1579 at [23] to [24] by Jacobs LJ (noting that the defendant's conduct must be sufficiently "inequitable" to justify rectification in cases of unilateral mistake).

However, the court may face practical difficulties in ordering rectification of the coded terms of a smart legal contract. One practical difficulty a court may face is that it may not be practically possible for the code to be amended if the code is recorded on a distributed ledger.[378] For example, if the code is deployed on a permissionless DLT system, no single entity has the power to amend the code.

5.15 The extent of any practical difficulties in rectifying coded terms will likely depend on the technical specifications of the particular smart contract platform, such as whether it is has relevant built-in functionality to rectify or reverse the effects of the coded terms. As Stephan Smoktunowicz put it, "this may ultimately depend on the complexity of the transaction and how easy it is to rectify in the smart contract/on the DLT".

5.16 The majority of consultees agreed that there would be practical difficulties in ordering rectification of the coded terms of a smart legal contract, primarily because rectification is difficult to achieve where the DLT system is effectively immutable.[379] Dr Robert Herian said that, unlike traditional contracts, "mistakes in smart contracts can be exacerbated by the architecture in which smart contracts operate, namely, the blockchain". He made the point that:

> 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.

5.17 Trakti Ltd similarly said that, on "truly immutable blockchains, a smart contract cannot be removed or altered once deployed".

5.18 The Society of Licensed Conveyancers said they did not foresee any difficulties with rectification, provided that the "terms of such rectification are clearly agreed by the parties". Herbert Smith Freehills and the Digital Law Association took the same view, on the proviso that the parties use a properly developed and well-designed smart contract platform, with the functionality and capability to draft in natural language. Herbert Smith Freehills said that in such a case, the parties "may then set out how the contract may be rectified, including any acts of reversal required between themselves". Where the parties do not make use of such a platform, they said that "the immutability of coded terms deployed on a permissionless (public, single ledger) distributed ledger architecture poses difficulties for rectification".

Solutions to overcome the practical difficulties associated with rectifying coded terms

5.19 Where the relevant smart legal contract is of such a nature that it cannot be rectified, a workaround may be needed. The Chancery Bar and Commercial Bar Association (joint response) noted that "courts may need to be creative and flexible as to the form of order". They said that:

---

[378] Tech London Advocates, *Blockchain: Legal & Regulatory Guidance* (2020) p 33.

[379] We asked consultees if they were aware of, or foresaw, any practical difficulties in ordering rectification of the coded terms of a smart legal contract. We also asked consultees if they thought that the parties to a smart legal contract were likely to seek rectification in practice: call for evidence, question 31 at para 5.26.

> 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.

Relatedly, Allen & Overy said that "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".

5.20 Where the code is deployed on a permissionless blockchain, the court could identify the error which needs to be rectified, and ask the parties to agree upon a revised piece of code. The court could then order the parties to deploy the revised code on the blockchain. Strictly speaking, however, the remedy would not be rectification of the contract, but the creation of a new contract between the parties.[380] Alternatively, if the code is recorded on a permissioned DLT system then, depending on the powers of the central administrator, it may be possible for the court to order the central administrator to amend, and thereby rectify, the code. Allen & Overy and Linklaters both agreed that the practical issues surrounding rectification of coded terms would be less of a concern in a system where the central administrator (or certain master nodes) had the authority to amend the code.

5.21 Catherine Phillips suggested that another way to amend the coded terms 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".

Obtaining rectification where the code has already performed

5.22 Another practical difficulty is that a party may only discover the error in the code, and therefore claim rectification, *after* the code has executed. In the context of traditional contracts, rectification is typically sought by a party who refuses to perform the contract according to its terms. The effect of rectification is to relieve that party from their liability to perform on those terms. Where a smart legal contract has been fully performed by code, rectification will not, in itself, provide an effective remedy for the claimant, who will want to reverse the effects of the code's performance.[381] Trakti Ltd noted that ordering rectification may therefore be "futile". Professor Hugh Beale wondered "whether there would ever be a need for formal rectification", as most cases will "involve performances that have already taken place".

5.23 We think that rectification may still be useful in cases where the code has already fully performed in so far as it provides a basis for the award of other remedies, such as breach of contract. Returning to the example in paragraph 5.11 above, suppose that Alice discovers the translation error in the code after the code has performed. As a result, Bob has paid Alice less than he would otherwise have done had the code accurately reflected the terms of the document. Alice, discovering what has happened,

---

380 This could be described as a form of "novation", being the substitution of a new smart legal contract for the old smart legal contract between the same parties: see H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 22-089; *Scarf v Jardine* [1882] 7 App Cas 345, 351.

381 S Green, "Smart contracts, interpretation and rectification" (2018) 24 *Lloyd's Maritime and Commercial Law Quarterly* 234, 251.

argues that there has been a "breach of contract" and seeks compensation for her losses under the transaction.

5.24 In the first instance, the court may need to construe the "meaning" of the coded terms to arrive at the conclusion that their meaning is clear, and that the coding error in the pricing formula forms part of the contractual terms. On this basis, it does not appear that Alice has a claim. As Herbert Smith Freehills pointed out, the "error simply forms part of the terms of the contract, performance of which would not amount to a breach of the contract". However, it might be possible to establish a breach of the smart legal contract if the court were to treat the contract as rectified. Rectification has retrospective effect: the contract will be "read as if it had always been in its rectified form".[382] If the court were to treat the terms as rectified, the smart legal contract would be read as if it had contained the correct pricing formula from the moment it was deployed on the distributed ledger. As a result, Alice would be able to establish that the contract was not performed by the computers on the DLT network in accordance with its terms.[383] To the extent that it was Bob's obligations that were defectively performed by the computers on the network, Alice would have a claim for breach of contract against Bob.[384]

5.25 In addition, we think that rectification is likely to be relevant where the parties have entered into an ongoing contract, or one that requires continuous performance,[385] and where the code may have partially (rather than fully) performed. As Professor Hugh Beale put it, "if the contract were continuing, then rectification would be useful". In such a case, rectification of the coded terms would ensure correct performance of the code in the future.[386] It would also enable the claimant to argue a breach of contract in relation to any past performance that did not comply with the coded terms, as rectified.

5.26 In sum, we think that rectification arguments may be more common in the smart legal contract context compared with traditional contracts. This is because translation errors are likely to be detected only after the code has (partially or fully) performed. As Herbert Smith Freehills observed, "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". In addition, we understand that the court may treat the terms of

---

382 *Cherry Tree Investments Ltd v Landmain Ltd* [2012] EWCA Civ 736, [2013] Ch 304 at [121] by Lewison LJ; C Mitchell, P Mitchell, S Watterson (eds), *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 40-32.

383 Where a contract is rectified, the question whether a party is in breach of the contract is determined by reference to the terms of the contract as rectified. See D Hodge, *Rectification: The Modern Law and Practice Governing Claims for Rectification for Mistake* (2nd ed, 2015) para 1-70.

384 See *Persimmon Homes Ltd v Hillier* [2019] EWCA Civ 800, [2020] 1 All ER (Comm) 475. This case concerned an appeal against an order of John Martin QC, sitting as a Deputy High Court Judge. John Martin QC ordered the rectification of a share sale agreement and a related disclosure letter, and subsequently declared the appellants to be in breach of warranties given by them in the agreement, as so rectified, and liable to pay damages. The appeal was dismissed by the Court of Appeal.

385 S Green, "Smart contracts, interpretation and rectification" (2018) 24 *Lloyd's Maritime and Commercial Law Quarterly* 234, 251.

386 S Green, "Smart contracts, interpretation and rectification" (2018) 24 *Lloyd's Maritime and Commercial Law Quarterly* 234, 251.

a contract as rectified without making an actual (formal) order for rectification.[387] Where the code has already fully performed, it might therefore be possible for the coded terms to be treated as rectified (to establish, for example, a breach of contract) without the court needing to order new code to be deployed, or a formal amendment of the coded terms. As Lord Justice Neill in *The Nile Rhapsody* said:

> In many cases, where the document is a document of title, or is a contract which is still to be performed, it will be necessary to rectify the document either by the execution of a substitute document or by the insertion of a correction or by the attachment of a sealed copy of the order for rectification. In the present case, however, it seems to me quite unnecessary that any formal rectification should take place. Equity can treat as done that which ought to be done.[388]

How likely are the parties to a smart legal contract to seek rectification in practice?

5.27 We think rectification may be more relevant in the smart legal contract context particularly because, as explained above, translation errors may frequently arise. In these cases, the parties are likely to seek rectification of the coded terms. The Chancery Bar Association and the Commercial Bar Association (joint response) added that "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".

5.28 However, as mentioned, practical difficulties may arise in rectifying coded terms, especially where the code is deployed on a permissionless DLT system. In this regard, we agree with Allen & Overy that even though rectification may not be possible from a technical standpoint, deployment of new code to arrive at the same practical outcome may be feasible. Courts may therefore need to be creative and flexible in their orders. In addition, as explained above, we do not think that performance of the code necessarily renders rectification "futile". As DLA Piper UK pointed out:

> In order to establish breach [of contract] 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.

5.29 Given the complexities involved in rectifying coded terms, some consultees said that parties to a smart legal contract may not seek rectification in practice. Florian Idelberger said that "if alternative means of dispute resolution can be used, these are quicker and less costly". Herbert Smith Freehills thought that "owing to the additional impacts arising from the need to rectify code", parties were unlikely to seek rectification in practice. Whether rectification will be sought in practice will depend on various factors, including the willingness of the courts to be flexible and creative in their orders, the specific circumstances and facts of the case, and the underlying technology in question. Its desirability will also depend on whether performance has taken place, and the presence of other vitiating factors, such as mistake.[389]

---

387 D Hodge, *Rectification: The Modern Law and Practice Governing Claims for Rectification for Mistake* (2nd ed, 2015) para 1-85.

388 *Hamed el Chiaty & Co v Thomas Cook Group Ltd (The Nile Rhapsody)* [1994] 1 Lloyd's Rep 382 at [43].

389 We discuss mistake in more detail from para 5.34.

VITIATING FACTORS

Overview

5.30 The law of England and Wales recognises various factors that render a contract defective. These are known as "vitiating factors". They include mistake, misrepresentation, duress and undue influence.

5.31 If a vitiating factor is established, then, depending on the vitiating factor in question, the contract may be "void" or "voidable".[390] If a contract is void, it is treated as though it never existed. An example of a vitiating factor that renders a contract void is mistake, which we discuss below. If a contract is "voidable", then it remains valid unless and until it is "rescinded" by the party who has the power to do so. The effect of rescission is that the contract is set aside from the start.[391] Examples of vitiating factors that render a contract voidable include misrepresentation, duress and undue influence.

5.32 Where a contract is void, or a voidable contract has been set aside, a party may obtain remedies to unwind the performance of the contract.[392] For example, if a party has transferred money or assets under a void contract, that party may bring a restitutionary claim to recover those benefits. The court will ordinarily require that party to make "counter restitution" of the benefits it received from the other party under the contract. The net effect is that the parties are returned, as far as possible, to the position they were in before they entered into the contract. Similar remedies may be awarded when a voidable contract is rescinded.[393]

5.33 In this section, we explain how the law on mistake, misrepresentation, duress and undue influence could be applied to smart legal contracts. We then turn to consider the remedies that might be awarded if a smart legal contract is void or has been set aside because of the presence of a vitiating factor.

Mistake

5.34 A contract can be rendered void if one or both parties laboured under a mistake when entering into the contract. A "mistake" can be described as an erroneous belief or assumption about a matter of fact or law.[394] A mistake made by both parties is known as a "common mistake" and a mistake made by one party is known as a "unilateral mistake".[395]

---

390 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) pp 178 to 179.

391 The term "rescission" is also sometimes used to describe the termination of the contract with prospective effect. However, today, the term is more commonly used to describe the retrospective setting aside or wiping away of the contract: see C Mitchell, P Mitchell, S Watterson (eds), *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 40-02.

392 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) pp 179 to 184.

393 This is discussed further from para 5.96.

394 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-8001; *Pitt v Holt* [2013] UKSC 26, [2013] 2 WLR 1200 at [108] to [109] by Lord Walker.

395 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-8001.

5.35 Not all mistakes made by the parties in entering into a contract will render the contract void. Mistake is a common law doctrine which has a narrow scope under the law of England and Wales. However, a mistake may provide a basis for claiming the remedy of rectification, even though the mistake is not one which voids the contract.[396] Further, where a party has entered into a contract under a mistake induced by the other party, the contract may be voidable for misrepresentation, even if not void for mistake.[397]

Common mistake

5.36 The doctrine of common mistake concerns the situation where the parties enter into a contract under a mistaken belief or assumption about a matter of fact or law relating to the subject matter of the contract, or the facts surrounding the formation of the contract. [398] The doctrine applies only where the mistake as to the factual circumstances in which the contract was made was common (that is, both parties made substantially the same mistake).[399] The doctrine also does not apply where the contract makes provision about who is to bear the risk of the mistake made by the parties. In that case, the consequences of the mistake are determined by reference to what the contract says.[400]

5.37 The law of England and Wales recognises only a very limited range of common mistakes that will render a contract void.[401] In *The Great Peace*, the Court of Appeal held that a contract is void for common mistake only if:[402]

(1) the parties shared a belief or assumption as to the existence of a state of affairs when they entered into the contract;

(2) contrary to that belief or assumption, the state of affairs did not exist; and

---

396 This is discussed from para 5.4.

397 This is discussed from para 5.77.

398 J Beatson, A Burrows and J Cartwright (eds), *Anson's Law of Contract* (31st ed 2020) p 296. "Common mistake" is now the usual term for cases in this category, rather than "mutual mistake" which was used in the past: H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-8001, fn 6.

399 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-8002.

400 *Great Peace Shipping Ltd v Tsavliris Salvage (International) Ltd (The Great Peace)* [2002] EWCA Civ 1407, [2003] QB 679 at [80] by Lord Phillips MR; *Associated Japanese Bank (International) Ltd v Credit du Nord* [1994] 1 WLR 255, 268, by Steyn J.

401 In addition to the doctrine of common mistake, a contract may also be void where there is a "mutual misunderstanding". A mutual misunderstanding occurs where the parties are at cross-purposes as to the subject matter of the contract, so that there is an objective ambiguity about what the parties have agreed. See H Beale (ed) *Chitty on Contracts* (34th ed 2021) para 5-019. If the ambiguity cannot be resolved by recourse to extrinsic evidence, the contract is void for lack of agreement: see *Raffles v Wichelhaus* (1864) 2 H&C 906.

402 *Great Peace Shipping Ltd v Tsavliris Salvage (International) Ltd (The Great Peace)* [2002] EWCA Civ 1407, [2003] QB 679 at [76] by Lord Phillips MR.

(3) the non-existence of the state of affairs renders performance of the contract, or the achievement of the "contractual adventure" (or the purpose of the contract) impossible.[403]

5.38 In stating these principles, the Court rejected the existence of a separate, equitable doctrine of common mistake, under which a contract would be voidable if the parties made a mistake that was "fundamental" or "material" to the performance of the contract.[404] That performance of the contract turns out to be more onerous than what the parties anticipated, because they were mistaken about some matter when they entered into the contract, is not sufficient to void the contract. The mistake made by the parties must go to the possibility of performance.

5.39 When parties enter into a smart legal contract, they may hold certain beliefs or assumptions about how the code will perform. Where the code executes in a way contrary to those beliefs or assumptions, the question that arises is whether the smart legal contract can be vitiated on the ground of common mistake. The ability of the parties to establish a common mistake will depend on the facts of the particular case. For example, where the parties conclude an accompanying natural language contract that contains terms about the operation of the code, and who is to bear the risk of mistakes about the code's performance, the question of common mistake will not arise.[405]

5.40 In addition, where it is not possible to know in advance precisely how the code will execute, a "mistake" about the execution of the code may be better characterised as a misprediction about how the future will turn out.[406] Having said that, we think it is conceivable that where the code, as written at the time the contract is entered into, is faulty and will fail to perform as the parties intend, such an instance may be regarded as a mistake as to a current state of affairs. In this regard, we think an analogy can be drawn with the situation where, unbeknownst to the parties at the time of conclusion of the contract, the subject matter of the contract does not exist.[407] In this case, the fact that the code will never perform as the parties intend it to could be akin to the non-existence of the "subject matter" of the contract. In other cases, even where the parties have made a mistake, the code might perform in such a way as to demonstrate the possibility of performing the contract, so that the mistake in question

---

403 In addition, the mistake must not be attributable to the fault of either party, and there must be no warranty by either party that the state of affairs exists; *Great Peace Shipping Ltd v Tsavliris Salvage (International) Ltd (The Great Peace)* [2002] EWCA Civ 1407, [2003] QB 679 at [76] by Lord Phillips MR.

404 *Great Peace Shipping Ltd v Tsavliris Salvage (International) Ltd (The Great Peace)* [2002] EWCA Civ 1407, [2003] QB 679 at [34], [160] to [161] by Lord Phillips MR, overruling *Solle v Butcher* [1950] 1 KB 671.

405 For example, if a party warrants under the natural language contract that the code will operate in a certain way, and the code turns out to operate in a different way, that party is likely to be held to have assumed the risk of being mistaken about the operation of the code, and will be precluded from relying on the doctrine of mistake. *Great Peace Shipping Ltd v Tsavliris Salvage (International) Ltd (The Great Peace)* [2002] EWCA Civ 1407, [2003] QB 679 at [76] by Lord Phillips MR (noting that common mistake is unavailable where one of the party warrants that the state of affairs exists); see also J Neuberger, W Choy, K Milewski, "Smart contracts: best practices", *Practical Law* (2020) (noting that contractual representations and warranties are likely to be critical to allocating risk in the creation and deployment of a smart legal contract).

406 *Pitt v Holt* [2013] UKSC 2, [2013] 2 WLR 1200 at [108] to [109] by Lord Walker.

407 *Associated Japanese Bank (International) Ltd v Credit du Nord* [1989] 1 WLR 255, [1988] 3 ALL ER 902, 269, by Steyn J; *Couturier v Hastie* [1856] UKHL J3, [1856] 10 ER 1065, 1069, by the Lord Chancellor.

is not sufficient to vitiate the contract. It is only where the code operates in such a way that achievement of the purpose of the contract is impossible that common mistake may operate.

5.41 Suppose Alice and Bob decide to effect a series of transactions via a piece of code deployed on Ethereum.[408] Ethereum charges a fee based on the amount of computing power required to effect transactions.[409] In an accompanying natural language contract, Alice promises to pay the fees to Ethereum in respect of the transactions. Alice and Bob believe that these fees will amount to no more than 10 Ether, based on a shared assumption about the amount of computing power required to execute the code. However, the execution of the code in fact requires much greater computing power than Alice and Bob originally thought. The code begins to execute, and Alice, noticing the extent of the platform fees, refuses to pay any further fees. The execution of the code is halted by the platform, pending payment. Bob insists that Alice is obliged to pay the fees under the natural language contract; Alice claims that the contract is void for common mistake.

5.42 Here, the contract is unlikely to be void on the ground of common mistake, for similar reasons to those given in *The Great Peace*. It could be argued that Alice and Bob shared a mistaken belief about a fact at the time of contracting: the computing power required to execute the code.[410] As a result of that mistake, performance of the contract differed from what the parties anticipated: Alice would have to pay much larger platform fees. However, despite Alice and Bob's mistake, it remains possible to perform the contract according to its terms, and therefore the contract is not void.[411]

The suitability of the existing principles of common mistake to smart legal contracts

5.43 Catherine Phillips pointed out that smart legal contracts may present "increased opportunities for both parties to make mistakes about the contractual terms which would not be covered by the current doctrine of common mistake".[412] Herbert Smith Freehills said that if parties decide to enter into a solely code smart legal contract, "the difficulty in arguing a case on the basis of common mistake (which is already legally and factually complex) will be heightened". They said that this was because, where the parties enter into a smart legal contract "using only code", risks associated with performance of the code will not be addressed in any accompanying natural language contract.

5.44 We agree with these observations; in the smart legal contract context, there are increased opportunities for parties to be mistaken about something fundamental or material to the performance of the contract. We do not, however, think this

---

408 We also used this example in the call for evidence, at para 5.38.

409 This is known as "gas": see A Antonopoulos and G Wood, *Mastering Ethereum: Building smart contracts and DApps* (2018) ch 1, https://github.com/ethereumbook/ethereumbook/blob/develop/01what-is.asciidoc.

410 If the computing power required for the code's performance could not be known at the time of contracting, it would be more accurate to say that Alice and Bob merely made a misprediction, not a mistake.

411 It could also be argued the risk of the mistake was allocated to Alice by the natural language contract, because Alice promised to pay those fees unconditionally.

412 We asked consultees if they were aware of, or foresaw, any difficulties in applying the existing law to determine whether the parties have made a common mistake when entering into a smart legal contract: call for evidence, question 32 at para 5.41.

necessitates expanding the scope of the doctrine of common mistake. In our view, the same principles of common mistake should continue to apply to smart legal contracts as they do traditional contracts. As Allen & Overy said, "in terms of determining whether a common mistake was made when entering into a smart contract the existing law suffices". Even though the law's restrictive approach to common mistake may impose hardship in some cases, as Lord Atkin said in *Bell v Lever Bros Ltd*:

> It is of paramount importance that contracts should be observed. If parties honestly comply with the essentials of the formation of contracts … they are bound, and must rely on the stipulations of the contract for protection from the effect of facts unknown to them.[413]

5.45 However, where the parties hold beliefs or make assumptions about how the code will perform, the parties would be well advised "to allocate the risks of [any potential] mistakes by appropriate drafting", as Herbert Smith Freehills recommended. This is especially so because, as the Chancery Bar and Commercial Bar Association pointed out, the "more remote in time to the actual transaction that the human involvement is", the less likely "that the mistake will be fundamental in the requisite sense". Where this is the case, the parties could seek other remedies, such as rectification of the terms of the smart legal contract.

Steps parties may take to satisfy themselves the code will execute as intended

5.46 The precautions parties to a smart legal contract may take to satisfy themselves that the code will perform as intended are likely to depend on a variety of factors.[414] These include the type of smart legal contract, its intended use, and the level of sophistication of the parties.

5.47 Dr Robert Herian made the general point that the "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". As Linklaters observed:

> 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.

5.48 Several consultees mentioned the possibility of testing the code in order to ensure that the code performs as intended. For example, Trakti Ltd mentioned "testing and simulating in a test environment the behaviour of the smart contract code to ensure it has no errors". Similarly, Dr Robert Herian said that common steps the parties may take to ensure the code will perform as intended include "reviewing [the] source code for bugs" and "performing audits" of the code to check how the code performs. Herbert Smith Freehills said that "sophisticated parties may wish to simulate the operation of

---

413 [1932] AC 161, 224.

414 We also asked consultees to explain what steps or precautions parties may take before entering into a smart legal contract to satisfy themselves that the code will execute as intended: call for evidence, question 33 at para 5.42.

the coded components of their contracts", although "it may be difficult or impossible to simulate all of the conceivable instances of the contract code over its lifecycle".

Unilateral mistake

5.49 The doctrine of unilateral mistake concerns the situation where only one of the parties is mistaken at the time the contract is made. Ordinarily, such a mistake provides no basis for a party to avoid their contractual obligations. However, if it can be shown that, at the time of entry into the contract, a party was mistaken as to a term of the contract, and the other party knew of this mistake, the contract is void. This is because the parties cannot be said to have reached an agreement, which is an essential requirement for the formation of a legally binding contract.[415]

5.50 A classic example of the doctrine of unilateral mistake is *Hartog v Colin & Shields*.[416] There, a seller offered to sell goods to a buyer. However, by mistake, the seller misquoted the price of the goods. The buyer purported to accept the seller's offer, and then sued when the seller refused to deliver the goods. The King's Bench held that the contract was void for unilateral mistake, because the buyer knew that the seller was mistaken about the price of the goods when the contract was made. Singleton J observed that "anyone with knowledge of the trade must have realised that there was a mistake" in the terms of the seller's offer, and therefore the buyer "could not reasonably have supposed that the offer contained the [seller's] real intention".[417] It followed that there was no agreement between the parties, and therefore no contract.

5.51 A similar situation could arise in the context of smart legal contracts. One party could make an offer to contract on terms set out in code, but be mistaken about those terms, to the knowledge of the other party. In considering how the law of unilateral mistake might apply, it is useful to distinguish between situations where coded terms are offered and accepted by human beings, and situations where they are offered and accepted by computer programs.

Where the coded terms are offered and accepted by human beings

5.52 Suppose Alice deploys a program on Ethereum,[418] the code of which is supposed to provide that if 100 Ether is sent to the program, the program will transfer a token to the person who sent the Ether.[419] By mistake, however, Alice codes the program so that it will transfer the token on the receipt of 10 Ether, instead of 100 Ether. Bob notices the program Alice has deployed and realises, given his experience of the cryptocurrency trade, that Alice must be offering to sell this token for 10 Ether by mistake. Nevertheless, he decides to snap up Alice's offer by sending 10 Ether to the program. The code performs and the token is transferred to Bob. Alice, realising what has

---

415 This is discussed from para 3.4; H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-009; A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 186.

416 [1939] 3 All ER 566.

417 *Hartog v Colin & Shields* [1939] 3 All ER 566, 568, by Singleton J.

418 We also used this example in the call for evidence, at para 5.46.

419 The formation of a legally binding contract through the deployment of a computer program on a distributed ledger is discussed in more detail in from para 3.26.

happened, claims that the contract is void for unilateral mistake, and seeks to recover the token from Bob.

5.53 In principle, the smart legal contract in this example may be void for unilateral mistake, for the same reason that the contract was void in *Hartog*.[420] When Alice deployed the program, Alice was mistaken about a term of her offer, namely the price, and Bob knew of this mistake when he accepted Alice's offer. Bob's purported acceptance is arguably therefore not effective to create a binding contract. As discussed earlier,[421] a unilateral mistake about the coded terms of a smart legal contract may provide a basis for claiming rectification of the code. However, since the code has already performed (and this kind of rectification is said to be a drastic remedy),[422] the preferred course for Alice may be to seek to avoid the contract on the ground of unilateral mistake, and claim restitution of the value of the token.[423]

5.54 Further support for this analysis, in the context of online contracting, can be found in the case of *Digilandmall*,[424] where a retailer mistakenly offered printers for sale on its website for a fraction of their normal retail price. A group of consumers ordered the goods, knowing that the printers must have been displayed at the advertised price by mistake. The Singapore Court of Appeal held that the resulting sales contracts were void for unilateral mistake, on the basis that the retailer was mistaken as to a term of the contract (the price) and the consumers knew of this mistake when they placed their orders.[425] We see no reason why a similar analysis could not be applied where an offer on mistaken terms is displayed, not on a website, but on a distributed ledger or other smart contract platform, provided that the mistake was known to the other party.

Where the coded terms are offered and accepted by computer programs

5.55 In other smart legal contracting scenarios, it may be more difficult to apply the principles of unilateral mistake. One situation which may pose challenges is where the coded terms of a smart legal contract are offered and accepted by computer programs on behalf of the parties.[426]

---

420 [1939] 3 All ER 566.

421 We discuss this in more detail from para 5.12.

422 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-078; *George Wimpey UK Ltd v VI Construction Ltd* [2005] EWCA Civ 77 at [65] by Sedley LJ (noting that rectification for unilateral mistake is a "drastic" remedy as it imposes a contract on the defendant that they did not intend to make); A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 191. See also H Beale (ed), *Chitty on Contracts* (34th ed 2021) at para 5-078 fn 386 where the point is made that rectification for unilateral mistake is often said to be a "drastic remedy" without reference to the fact that, in the classic case of unilateral mistake known to the defendant, to refuse rectification would be equally harsh on the claimant.

423 The ability to claim restitution of benefits transferred under void contracts is discussed from para 5.91.

424 *Chwee Kin Keong and others v Digilandmall.com Pte Ltd* [2005] 1 SLR(R) 502.

425 *Chwee Kin Keong and others v Digilandmall.com Pte Ltd* [2005] 1 SLR(R) 502 at [88] to [99].

426 As discussed from para 3.26, it may be possible under the law of England and Wales for a legally binding agreement to be concluded automatically by computer programs.

5.56 Suppose Alice deploys a computer program on a cryptocurrency exchange platform.[427] The program is coded to purchase bitcoin on Alice's behalf at the best available price on the platform. Bob also deploys a computer program on the platform, which is designed to sell bitcoin. Bob's program is coded so that, if there are no other offers to sell bitcoin on the platform, the program is to offer bitcoin at a highly inflated price. A system error occurs on the platform, which dramatically reduces the number of offers to sell bitcoin on the platform. As a result, Bob's program automatically offers bitcoin at the highly inflated price, and Alice's program automatically accepts that offer, it being the best available price for bitcoin on the platform. A contract for the sale of bitcoin is formed and the transaction is performed by the parties' programs. Alice, realising what has happened, claims that the contract is void for unilateral mistake. She says she believed, mistakenly, that bitcoin transactions on the platform would be concluded at prices approximating market rates, and Bob took advantage of this mistake by embedding a highly inflated price in his program.

5.57 A similar fact pattern was considered by the Singapore Court of Appeal in *Quoine Pte Ltd v B2C2 Ltd ("Quoine")*.[428] In that case, the majority rejected the argument that the contract was void for unilateral mistake. The Court reasoned that there was no mistake as to the terms of the contract (namely, the price of the bitcoin), because the parties' computer programs had operated exactly as designed.[429] The purchaser of the bitcoin (Alice, in the above example) had merely made a mistake as to how the programs would behave in the event of a system failure on the platform.[430] This was not sufficient for a unilateral mistake. In any event, even if this were a relevant mistake, the seller (Bob, in the above example) did not have knowledge of it. As the contract was made by deterministic computer programs, meaning that they were always going to operate within the parameters set by the programmer, the relevant enquiry was whether the programmer had designed its program to take advantage of the type of system failure that occurred.[431] The majority framed the enquiry as follows:

> when programming the algorithm, was the programmer 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 was the programmer acting to take advantage of such a mistake?[432]

The evidence in *Quoine* fell short of establishing that the programmer had this state of mind when designing the program.

5.58 Mance IJ,[433] in dissent, commented that the principles of unilateral mistake should be adapted to accommodate contracts concluded automatically by computer

---

427 We also used this example in the call for evidence, at para 5.50.

428 [2020] SGCA(I) 02 ("*Quoine*").

429 *Quoine* at [114] to [115].

430 *Quoine* at [115].

431 *Quoine* at [98], [104].

432 *Quoine* at [103].

433 International Judge.

programs.[434] As computer programs always operate deterministically according to their instructions, it is inappropriate in this context to insist on a mistake as to the terms of the contract. A fundamental mistake as to *how* the computer programs would operate should be sufficient, and the buyer in *Quoine* had made such a mistake.[435] In assessing whether the seller had knowledge of this mistake, the Court did not need to examine the state of mind of the programmer when designing its program. The Court could instead take a practical approach and ask whether a reasonable trader, with knowledge of the circumstances surrounding the transactions, would have concluded that the transactions were the result of a fundamental computer error.[436] Applying these principles, Mance IJ was satisfied that the contract in *Quoine* was vitiated on the ground of unilateral mistake.

5.59 Mance IJ's approach was based on the existence of an equitable doctrine of unilateral mistake under Singaporean law, which recognises mistakes other than those concerning the terms of the contract.[437] However, the existence of an equitable jurisdiction to set aside contracts for mistake has been rejected in England and Wales.[438] In this jurisdiction, unilateral mistake is exclusively a common law doctrine, and the mistake must be about the terms of the contract.[439] This poses an obstacle to our courts adopting the approach advocated by Mance IJ in *Quoine*.

Adapting the principles of unilateral mistake in the context of smart legal contracts concluded by computer programs

5.60 The majority in *Quoine* (as well as Mance IJ, albeit relying on the equitable doctrine of unilateral mistake) effectively adapted the principles of unilateral mistake to accommodate contracts concluded by the autonomous interaction of the parties' computer programs.[440] As Herbert Smith Freehills pointed out, the approach of the majority 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".

5.61 Some consultees were of the view that no change to the existing principles of unilateral mistake is required. Allen & Overy said that the history of algorithmic trading (which involves the parties entering into the contract through computer programs without human intervention) "has not suggested a change in the doctrine of unilateral mistake is needed to allow them to flourish or operate in a robust manner". Indeed, Allen & Overy did not consider that there was any need to expand the scope of the

---

434 *Quoine* at [183].

435 *Quoine* at [201].

436 *Quoine* at [192].

437 *Quoine* at [162] to [163].

438 *Great Peace Shipping Ltd v Tsavliris Salvage (International) Ltd (The Great Peace)* [2002] EWCA Civ 1407, [2003] QB 679 (in relation to common mistake); *Statoil ASA v Louis Dreyfus Energy Services LP (The Harriette N)* [2008] EWHC 2257 (Comm), [2008] 2 Lloyd's Rep 685 (in relation to unilateral mistake).

439 *Statoil ASA v Louis Dreyfus Energy Services LP (The Harriette N)* [2008] EWHC 2257 (Comm), [2008] 2 Lloyd's Rep 685.

440 In fact, the Court said as much: "we consider that the existing body of law can be meaningfully adapted to deal with the situation at hand": *Quoine* at [79].

doctrine, and considered the existing law "to be sufficient".[441] Similarly, Linklaters thought that there was no "particular justification for departing from the normal principles" of unilateral mistake.

5.62 Similar to the approach of the majority in *Quoine*, we do not think a fundamental change to the existing principles of unilateral mistake in the context of smart legal contracts concluded by the autonomous interaction of the parties' computer programs is needed. However, we do consider that *some* adaptation of the current approach is needed; a deterministic computer program will always operate within the parameters set by the programmer, and will only do what it is programmed to do.[442] As such, when it comes to determining whether the non-mistaken party had knowledge of the mistaken party's mistake, the principles of unilateral mistake will have to be adapted to cater for smart legal contracts concluded by the autonomous interaction of the parties' computer programs. In our view, the pertinent question is therefore not whether the rules of unilateral mistake should be changed, but rather how the existing rules should be adapted. We consider this question by focusing on whether the scope of unilateral mistake should be expanded beyond the terms of the contract, and on the test the court should apply in determining whether the non-mistaken party had knowledge of the mistaken party's mistake.

Expanding the scope of unilateral mistake beyond the terms of the contract

5.63 Two consultees thought that the scope of unilateral mistake should be expanded beyond mistake in relation to the terms of the smart legal contract. Florian Idelberger said that not only should the terms of the contract be considered, "but the whole interaction, including user interface and marketing materials". DLA Piper UK said that, if the fundamental purpose of the doctrine of unilateral mistake is to prevent one party from taking advantage of a mistake they are aware of, then "it may be appropriate to extend the protection provided by the doctrine to other errors". An example of such an error was "a mistake as to the effect of a term, rather than as to the term itself".

5.64 We take the view, however, that the scope of unilateral mistake should be confined to a mistake in relation to the terms of the smart legal contract, as under the current law. Like Professor Hugh Beale, we do not consider that smart legal contracts should be treated differently to natural language contracts in this respect. As Clifford Chance said:

> 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.

5.65 Herbert Smith Freehills also emphasised the uncertainty that might arise in expanding the scope of the doctrine. In particular, they said that such an expansion:

---

441 We asked consultees if they thought that the legal principles concerning unilateral mistake might need to be adapted to accommodate smart legal contracts concluded by computer programs without human intervention: call for evidence, question 34 at para 5.56. In particular, we asked consultees if they thought it was appropriate to confine a unilateral mistake to a mistake about a term of the smart legal contract, and what test the court should apply in determining whether the non-mistaken party had knowledge of the mistaken party's mistake.

442 *Quoine* at [98].

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.

5.66 This argument also applies to traditional, non-smart legal contracts, and emphasises the need to keep the scope of the doctrine narrow.

The test for determining whether the non-mistaken party had knowledge of the mistaken party's mistake

5.67 In *Quoine*, the trading contracts were made by deterministic computer programs, meaning that they were always going to operate within the parameters set by the programmer. The majority therefore framed the enquiry as follows:

> when programming the algorithm, was the programmer 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 was the programmer acting to take advantage of such a mistake?[443]

5.68 The Chancery Bar Association and the Commercial Bar Association (joint response) thought that the formulation of the test adopted by the majority in *Quoine* was "very strict". In their view, the "would only ever" requirement would be "very hard to satisfy in practice". Instead, they suggested an alternative approach:

> 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.

On this approach, "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". They thought this revision to the test "could potentially be introduced through legislation".

5.69 Herbert Smith Freehills was of the view that, even though the approach of the majority in *Quoine* was a "sensible one", it was not without its difficulties. For example, where an algorithm was written collaboratively by multiple parties, it would not be practical to ask whether the programmer (when programming the algorithm) was doing so with knowledge of the fact that the offer would only ever be accepted by a party operating under a mistake. They said that even though Mance IJ's approach provided a "pragmatic solution" to these difficulties, his approach would "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)".

5.70 Two consultees raised the point that adopting a test which includes constructive knowledge of the mistake on the part of the non-mistaken party could be useful in this context. Professor Hugh Beale noted that it is "not clear at the moment whether there can be relief at common law if [the non-mistaken party] should have known of [the] mistake as to the terms of the contract". In his view, if the non-mistaken party should have known of the mistake, then the contract should be "void or perhaps voidable".

---

443 *Quoine* at [103].

DLA Piper UK similarly made the point that, since parties are likely to have minimal interaction before concluding a solely code smart legal contract, "the likelihood of being able to establish 'actual knowledge' of a mistake may be limited". As such, they thought it may 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".

5.71 In relation to the second aspect of "adapting" the test of unilateral mistake, consultees provided views and critiques as to the possible test a court could apply in determining whether the non-mistaken party had knowledge of the mistaken party's mistake in this context. With regard to the Chancery Bar and Commercial Bar Association's suggested approach, a test that focuses on "foresight" of the relevant mistake addresses the "strict" nature of the approach of the majority in *Quoine*. In our view, however, such an approach risks weakening the test for establishing a unilateral mistake, thereby unduly expanding the scope of the doctrine. The doctrine of mistake traditionally has a narrow scope in this jurisdiction, given that its presence is a factor vitiating consent. Requiring foresight that a mistake of the type which was eventually made was likely in order to establish "knowledge" on the part of the non-mistaken party could, in our view, enable parties to escape from contracts in circumstances where they otherwise should not be entitled to.

5.72 In our view, a test which includes constructive knowledge of the mistake on the party of the non-mistaken party could be useful in this context.[444] The non-mistaken party could be said to have constructive knowledge of the mistaken party's mistake if it ought to have been apparent to any reasonable person in that party's position.[445] Since parties are unlikely to have prior interactions before concluding a solely code smart legal contract, the likelihood of being able to establish actual knowledge of the mistake may be limited.

5.73 There is also some judicial support for the notion that constructive knowledge is sufficient in the context of unilateral mistake.[446] In *Centrovincial Estates Plc v Merchant Investors Assurance Co*,[447] the Court of Appeal appeared to consider that the claimant might be able to negate any binding agreement by showing that the defendant ought to have known that the claimant's offer contained an error.[448] In *OT Africa Line Ltd v Vickers Plc*,[449] Mance J (as he then was) said that the objective principle would be displaced if a party knew or ought to have known of the mistake.[450] Although some authors suggest that the sufficiency of constructive knowledge is

---

444 See also N Yeo, "Mistakes and knowledge in algorithmic trading: the Singapore Court of Appeal case of *Quoine v B2C2*" (2020) 5 *Butterworths Journal of International Banking and Financial Law* 300, p 304, where the point was made that "the prism of constructive knowledge for common law unilateral mistake under English law may enable courts here to reach a very similar result to that which Lord Mance achieved".

445 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-023.

446 See H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-023.

447 [1983] Com LR 158.

448 See H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-023.

449 [1996] 1 Lloyd's Rep 700.

450 See H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-023.

something of an open question,[451] others state the test for knowledge in the context of unilateral mistake as including constructive knowledge.[452] All that may therefore be required is a clarification by the courts to this effect.

5.74 In our view, the approach of the majority in *Quoine* serves as a useful reference point for a court in this jurisdiction approaching this problem. The test formulated by the majority takes into account the nature of deterministic computer programs, and is alive to the limitations of applying the existing principles of unilateral mistake in such a context. In addition, the test as formulated by the majority includes actual or constructive knowledge of the mistake, albeit that the latter features in relation to the equitable doctrine of unilateral mistake under Singaporean law.[453] We take the point that the test is "strict", and may be difficult to prove in practice, but this is not necessarily at odds with our existing doctrine of mistake, which has a narrow scope.

5.75 In addition, where multiple parties are involved in programming the computer program, we do not think this is an insurmountable hurdle for the courts to grapple with. In these cases, the focus could (for example) be on the state of mind of the senior programmer, or the person in charge of overseeing the programming. However, we acknowledge that where the computer program is complex and written by multiple programmers over an extended period of time, applying the test in its current formulation may be less straightforward.[454] Each case will depend on its own facts. Overall, we agree with the Singapore Court of Appeal that a court applying the common law should "apply the existing law on the doctrine [of unilateral mistake] subject to incremental adjustments being made to suit the particular context".[455]

5.76 In sum, we think that the test for determining whether a non-mistaken party has knowledge of the mistaken party's mistake, where the smart legal contract is concluded through the autonomous operation of computer programs, requires adaptation. Crucially, though, we do not think wholesale revision or fundamental development of the common law is necessary; nor do we think that legislative reform is required or appropriate. Any adaptation of the test that the courts adopt should be incremental, and sensitive to the unique nature of smart legal contracts concluded through the autonomous operation of computer programs. This entails, amongst other things, formulating a test that addresses whose knowledge of the mistake is relevant, the time frame for assessing that person's knowledge, and the type of knowledge that is required.

Misrepresentation

5.77 Under the law of England and Wales, a contract is vitiated if a party was induced to enter into the contract by a misrepresentation made by the other party. A

---

451 See H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-023: "It is not clear whether for the mistake to be operative it must actually be known to the other party, or whether it is enough that it ought to have been apparent to any reasonable person in the position of the other party".

452 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 184.

453 See H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 5-023, fn 91.

454 For a general critique of the approach of the majority in *Quoine*, see K Low and E Mik, "Lost in transmission: unilateral mistakes in automated contracts" (2020) 136 *Law Quarterly Review* 563, 567.

455 *Quoine* at [79].

"misrepresentation" can be defined as a false representation, by words or conduct, about a matter of fact or law.[456] A misrepresentation can be fraudulent,[457] negligent,[458] or innocent.[459] In cases of negligent and innocent misrepresentation, the claimant must prove that, but for the misrepresentation, they would not have entered into the contract.[460] In cases of fraudulent misrepresentation, it is sufficient that the misrepresentation was merely a reason for the claimant deciding to enter into the contract.[461]

5.78 In all cases where misrepresentation is established, the contract is voidable: 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.[462] Where the claimant has suffered loss as a result of entering into the contract, the claimant may be entitled to damages under tort law,[463] or under the Misrepresentation Act 1967 (the "1967 Act").[464] Under the 1967 Act, it is generally not necessary for the claimant to prove that the losses were a reasonably foreseeable consequence of the misrepresentation.[465] The defendant is likely to be liable for all losses suffered by the claimant as a result of the misrepresentation, provided those losses are not otherwise too remote.[466]

---

456 Whether a representation is "false" depends upon how the words or conduct would be understood by a reasonable person in the factual context: H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 9-006; *IFE Fund SA v Goldman Sachs International* [2006] EWHC 2887 (Comm), [2007] 1 Lloyd's Rep 264, [50] by Toulson J.

457 Where the party making the representation knows that it is false or is reckless as to whether it is true or false: *Derry v Peek* (1889) 14 App Cas 337.

458 Where the party making the representation did not have reasonable grounds for believing it to be true: *Hedley Byrne & Co Ltd v Heller & Partners Ltd* [1964] AC 465, *Esso Petroleum Co Ltd v Mardon* [1976] QB 801.

459 Where the party making the representation was neither fraudulent nor negligent.

460 *JEB Fasteners Ltd v Marks Bloom & Co* [1983] 1 All ER 583. This includes the situation where the claimant, but for the misrepresentation, would not have entered into the contract on the same terms: *Raiffeisen Zentralbank Osterreich AG v Royal Bank of Scotland plc* [2010] EWHC 1392 (Comm), [2011] 1 Lloyd's Rep 123, [171] to [172] by Christopher Clarke J.

461 *Edgington v Fitzmaurice* (1885) 29 Ch D 459.

462 The bars to rescission are discussed from para 5.97, at fn 500. In addition, where a consumer has been induced by a misrepresentation made by a trader to enter into a contract, the misrepresentation may amount to an "unfair commercial practice" under the Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277, and the consumer may be entitled to unwind the contract or claim damages.

463 The tort of deceit (in the case of fraudulent misrepresentation) or the tort of negligence (in the case of negligent misrepresentation).

464 Misrepresentation Act 1967, s 2(1).

465 Misrepresentation Act 1967, s 2(1).

466 *Royscot Trust Ltd v Rogerson* [1991] 2 QB 297. However, note that some later decisions have refrained from expressing views about the correctness of the approach to damages in *Royscot*, which held that the measure of damages in terms of section 2(1) of the Misrepresentation Act 1967 is that of a fraudulent misrepresentation. In particular, it has been questioned whether the words of section 2(1) of the Misrepresentation Act 1967 are so plain that the measure of damages applicable to innocent misrepresentation is the same as the measure of damages applicable to fraudulent misrepresentation at common law. On this point, see *Smith New Court Securities Ltd v Scrimgeour Vickers (Asset Management) Ltd* [1997] AC 254, 267 and E Peel (ed), *Treitel on The Law of Contract* (15th ed 2020) para 9-082.

5.79 It is open to the parties to agree to a term which excludes or restricts liability for misrepresentation. However, section 3(1) of the 1967 Act provides that such a term is of no effect unless it satisfies the requirement of "reasonableness" in the Unfair Contract Terms Act 1977.[467] To meet the reasonableness requirement, the term must be a "fair and reasonable one" to include, having regard to the circumstances which were, or ought reasonably to have been, known to or in the contemplation of the parties when the contract was made.[468] Whether a clause excluding or restricting liability for misrepresentation is "fair and reasonable" is necessarily a fact-sensitive enquiry. In general, courts will not strike down such a clause as unreasonable where the parties were of equal bargaining power, and were legally advised when entering into the contract.[469] Section 3(1) of the 1967 Act does not apply to "consumer contracts".[470] However, under the Consumer Rights Act 2015 (the "CRA 2015"), a term in a consumer contract which excludes or limits liability for misrepresentation will not be binding on the consumer if the term is "unfair".[471]

Misrepresentation in the context of smart legal contracts

5.80 We do not anticipate that smart legal contracts will give rise to novel legal issues in determining whether a party has been induced to enter into the contract by a misrepresentation made by the other party.[472] Like traditional contracts, entry into a smart legal contract may be preceded by a period of negotiation or other interaction between the parties. Existing legal principles can determine the question of whether one party, by their words or conduct, made a misrepresentation in those pre-contractual interactions which induced the other party to enter into the smart legal contract.[473] Agreeing that the existing principles of misrepresentation can accommodate smart legal contracts, Herbert Smith Freehills said that a "court or tribunal may require the assistance of experts to identify the meaning and significance of any pre-contractual representations".

---

467 Whether a term excludes or limits liability for misrepresentation is a question of substance, not form. The clause need not exclude or limit liability for misrepresentation by its express terms. A clause which has the effect of preventing liability for misrepresentation from arising may be sufficient. An example is a "no reliance" clause, where a party agrees that they have not relied upon any representation made by the other party in entering into the contract. If, but for the no reliance clause, the claimant would have a claim in misrepresentation against the other party, the court will treat the no reliance clause as a term which excludes or restricts liability for misrepresentation, so that it is subject to the reasonableness requirement in the Unfair Contract Terms Act 1977: see *First Tower Trustees Ltd v CDS (Superstores International) Ltd* [2018] EWCA Civ 1396, [2019] 1 WLR 637.

468 Unfair Contract Terms Act 1977, s 11(1).

469 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 106; *Watford Electronics Ltd v Sanderson CFL Ltd* [2001] EWCA Civ 317, [2001] 1 All ER (Comm) 696.

470 Misrepresentation Act 1967 s 3(2). A "consumer contract" is a contract between a trader and a consumer: Consumer Rights Act 2015, s 61(1) and (3).

471 CRA 2015, s 62(1). We discuss the unfairness test in more detail in Chapter 6 from para 6.11.

472 We asked consultees if they were aware of, or foresaw, any difficulties in applying the existing law to determine whether a smart legal contract has been entered into as a result of a misrepresentation: call for evidence, question 35 at para 5.62. The majority of consultees did not foresee any difficulties in applying the existing law of misrepresentation to smart legal contracts.

473 The remedies that might be awarded when a smart legal contract is found to be vitiated by misrepresentation are discussed from para 5.96.

5.81 Dr Herian suggested that difficulties may arise in determining if a misrepresentation has occurred. He said that, although this issue may arise in any contract setting, it "can be especially difficult when dealing with technology that doesn't leave room for interpretation". In the first instance, as we discuss in Chapter 4, we do not agree that smart contract technology does not "leave room for interpretation". In addition, ascertaining whether a misrepresentation has occurred should be the same enquiry regardless of whether the contract is a smart legal contract or a traditional contract. Although, as Professor Kelvin FK Low pointed out, it is more likely that "any misrepresentation that has occurred will be outside the code".[474]

5.82 The Digital Law Association observed that any difficulties that arise in this context are in relation to establishing who made the representation, and whether a reasonable person would believe that that person had the authority to do so, rather than in relation to existing legal principles. They said that:

> 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.

5.83 We think the point made by the Digital Law Association is a significant one. In the context of smart legal contracts, there may be a broad range of persons who provide statements as to how a smart legal contract or particular platform might operate. As the Digital Law Association said, the issue that arises in these cases is ascertaining who made the relevant misrepresentation, and whether that person had the authority to do so. These considerations are important. In terms of section 2(1) of the 1967 Act, relief can only be granted to a person who entered into a contract due to a misrepresentation where the person who made the misrepresentation was the other party to the contract, or their agent.[475] Even though the common law of tort is broader, and allows a party to claim relief where the person who made the negligent misrepresentation was not the other party to the contract, this is subject to the restrictive test set out in *Hedley Byrne & Co Ltd v Heller & Partners Ltd*.[476]

5.84 For example, if Alice (a founding contributor to a protocol) makes a negligent misrepresentation to Bob which induces Bob to enter into a smart legal contract with Chris (and Alice is not Chris's agent), Bob will not be able to claim relief against Chris.[477] Since Chris did not make the misrepresentation, no claim for damages can be brought against Chris in terms of section 2(1) of the 1967 Act, or in terms of the common law of tort. In addition, Bob would have no right to rescind the contract with Chris, and would therefore not be entitled to recover damages instead of rescission in terms of section 2(2) of the 1967 Act.[478] Bob would also not be able to claim relief against Alice (the person who made the misrepresentation) in terms of the 1967 Act.

---

474 We discuss rescission from para 5.96.

475 Misrepresentation Act 1967, s 2(1). See *Taberna Europe CDO II plc v Selskabet* [2016] EWCA Civ 1262, [2017] QB 633 at [44] by Moore-Bick LJ.

476 [1964] AC 46.

477 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 9-030.

478 *Taberna Europe CDO II plc v Selskabet* [2016] EWCA Civ 1262, [2017] QB 633 at [43] by Moore-Bick LJ.

Since Alice is not a party to the contract between Bob and Chris, no claim for damages can be brought against Alice in terms of section 2(1) of the 1967 Act. This means that the 1967 Act may find narrower application in the context of smart legal contracts, as misrepresentations made by non-contracting parties (which the Digital Law Association thinks are likely to be common) are not within the scope of the Act. Instead, a claimant in Bob's position will have to bring a claim against Alice under the common law of tort for damages caused by Alice's negligent misrepresentation.[479] However, in such a case, the misrepresentation will only be regarded as negligent if the relationship between the parties is such as to give rise to a duty of care owed by Alice to Bob in making the statement.[480]

Excluding or limiting liability for misrepresentation

5.85 If the parties have included clauses in the natural language element of their smart legal contract which seek to exclude or limit liability for misrepresentation, the existing law can be applied in the conventional way. The question would be whether those clauses were "fair and reasonable" under the Unfair Contract Terms Act 1977 or, in the case of consumer contracts, "unfair" under the CRA 2015.

Duress and undue influence

5.86 A contract is vitiated for duress where a party was induced to enter into the contract by an illegitimate threat made by the other party.[481] Examples of illegitimate threats are threats of violence against the person,[482] wrongful threats to destroy or damage property,[483] and threats to commit a breach of contract.[484] Where it is proven that, but for the illegitimate threat, the claimant would not have entered into the contract, the claimant can rescind the contract.[485]

5.87 A contract can also be vitiated where a party enters into a contract under the undue influence of the other party. Undue influence arises in situations where, because of the relationship between the parties, the claimant is unable to exercise free and independent judgement when entering into the contract.[486] In the context of certain relationships, it will be presumed that the claimant entered into the contract under the undue influence of the other party, if the contract was concluded on disadvantageous

---

479 *Taberna Europe CDO II plc v Selskabet* [2016] EWCA Civ 1262, [2017] QB 633 at [43] by Moore-Bick LJ.

480 *Hedley Byrne & Co Ltd v Heller & Partners Ltd* [1964] AC 465.

481 *Pakistan International Airline Corporation v Times Travel (UK) Ltd* [2021] UKSC 40, [2021] 3 WLR 727 at [62] by Lord Burrows.

482 *Barton v Armstrong* [1976] AC 104.

483 *Occidental Worldwide Investment Corporation v Skibs A/S Avanti* [1976] Lloyd Rep 293.

484 *North Ocean Shipping Co Ltd v Hyundai Construction Co Ltd* [1979] QB 705; *Pao On v Lau Yiu Long* [1979] UKPC 17, [1980] AC 614.

485 *Pakistan International Airline Corporation v Times Travel (UK) Ltd* [2021] UKSC 40, [2021] 3 WLR 727 at [62] by Lord Burrows.

486 *Royal Bank of Scotland v Etridge (No 2)* [2001] UKHL 44, [2002] 2 AC 773.

terms to the claimant.[487] In other cases, undue influence may be proven on the facts.[488] Where undue influence is established, the claimant can rescind the contract.

5.88 We do not anticipate that smart legal contracts will give rise to any novel legal issues in determining whether a contract has been entered into under duress or undue influence. As in the case of traditional contracts, the question will be whether the claimant entered into the smart legal contract because of illegitimate threats made by the other party or under the undue influence of the other party.[489] Although we did not ask a specific question about this in the call for evidence, nothing in consultee responses suggests an alternative analysis is required.

REMEDIES WHERE THE CONTRACT HAS BEEN VITIATED

5.89 As explained above, a contract which is vitiated may be either void or voidable. In the case of void contracts, a party may claim a restitutionary remedy to recover benefits transferred under the void contract. In the case of voidable contracts, a party can also claim restitutionary remedies, provided the contract is validly rescinded.

5.90 We anticipate that restitutionary remedies may be particularly relevant in the context of smart legal contracts. In a traditional contracting scenario, parties are likely to cease performing the contract when they discover the factor rendering the contract void or voidable. However, in a smart legal contract context, some or all of the terms are performed automatically by code. Depending on the nature of the platform and the code in question, there may be no mechanism for the parties to stop the execution of the code.[490] The code may continue to execute (and fully execute), regardless of the fact that the contract has been vitiated. In these circumstances, the parties are likely to rely on restitutionary remedies to recover benefits transferred by the code under the defective smart legal contract. Below we consider how restitutionary remedies might be awarded in this situation.

Remedies where the contract is void

5.91 If a contract is void, the contract is non-existent from the start and creates no legal obligations between the parties. However, a party may have rendered performance under the void contract. That party may be entitled to recover those benefits under the

---

487 See *Mitchell v Homfray* (1881) 8 QBD 587 (presumed relationship of influence between doctor and patient); *Wright v Carter* [1903] 1 Ch 27 (presumed relationship of influence between solicitor and client); *Lancashire Loans Ltd v Black* [1934] 1 KB 380 (presumed relationship of influence between parent and child).

488 See, for example, *Lloyds Bank Ltd v Bundy* [1975] QB 326 (factual relationship of influence between a bank and its elderly customer) and *Credit Lyonnais Bank Nederland v Burch* [1997] 1 All ER 144 (factual relationship of influence between an employer and junior employee).

489 We discuss the remedies that might be available where a smart legal contract has been vitiated for duress or undue influence from para 5.96.

490 This is likely to be the case where the code is deployed on a permissionless DLT system, because the code will be effectively immutable. In contrast, if the code is deployed on a permissioned DLT system, the central administrator may have the power to halt performance of the code or reverse transactions performed by the code.

law of unjust enrichment. To succeed in an unjust enrichment claim, the claimant must establish the following:[491]

(1) *enrichment of the defendant*: the defendant must have received a benefit from the claimant that is objectively valuable, such as money, property or a service;

(2) *at the claimant's expense*: the claimant must have incurred a loss through the provision of the benefit to the defendant; and

(3) "*unjust factor*": the claimant must prove that the benefit was transferred in circumstances which the law recognises as unjust. These include that the benefit was transferred to the defendant by mistake or upon a basis which has failed.

5.92 Where a party has transferred a benefit to another party under a void contract, the above requirements for a claim in unjust enrichment are likely to be satisfied. The benefit transferred under the void contract would constitute an enrichment, received by one party at the expense of the other. If the party who transferred the benefit believed, mistakenly, that the contract was valid, the unjust factor of mistake is likely to apply. Alternatively, the unjust factor could be failure of basis. The argument would be that the basis for the transfer of the benefit was that there was a valid contract in existence between the parties. As the contract was void, that basis for the transfer failed, and it would therefore be unjust for the defendant to retain the benefit.[492]

5.93 The remedy for unjust enrichment is restitution. The purpose of a restitutionary remedy is to reverse the defendant's enrichment. It usually takes the form of a monetary award, representing the value of the defendant's enrichment.[493] It may be possible to obtain a proprietary remedy for unjust enrichment: for example, an order that the defendant holds property transferred under the void contract on trust for the claimant. However, the availability of proprietary remedies for unjust enrichment has not been authoritatively determined in this jurisdiction.[494]

5.94 In some cases, the defendant may also have transferred benefits to the claimant under the void contract. In that case, the claimant's ability to obtain restitution will be conditional on the claimant providing "counter restitution" of any benefits it received from the defendant under the contract.[495] Otherwise, the claimant would be unjustly enriched at the expense of the defendant.

5.95 We do not anticipate that the courts will encounter novel legal issues or practical difficulties in awarding restitutionary remedies if a smart legal contract is void. The questions in the smart legal contracting context would be the same: whether one party

---

491 See *Banque Financière de la Cité v Parc (Battersea) Ltd* [1999] 1 AC 221, 227, by Lord Steyn.

492 See *Guinness Mahon & Co Ltd v Kensington and Chelsea RLBC* [1999] QB 215; C Mitchell, P Mitchell, S Watterson (eds), *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 13-027.

493 *Bank of Cyprus UK Limited v Menelaou* [2015] UKSC 66, [2016] AC 176 at [81] by Lord Neuberger.

494 C Mitchell, P Mitchell, S Watterson (eds), *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) paras 40-18 to 40-30.

495 C Mitchell, P Mitchell, S Watterson (eds), *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) para 31-01.

has been enriched at the other party's expense in circumstances which are unjust. In *Quoine*, the appellant argued that because the trading contracts were void for unilateral mistake, the counterparties to the trades were entitled to restitution of the bitcoin that was transferred to the respondent. The Singapore Court of Appeal had no difficulty in characterising the receipt of the bitcoin as an "enrichment".[496] Further, it observed that the enrichment (albeit indirectly) was "at the expense of" the appellant.[497] However, as the Court found that the counterparties to the trades were not mistaken, and therefore that the trading contracts remained valid, it was not possible to identify an unjust factor.[498] The claim for restitution in *Quoine* therefore failed. However, the case indicates that it may be possible to apply the relevant legal principles without difficulty. Even though we did not ask consultees a specific question about applying the principles of restitution in this way, nothing in their responses suggests an alternative analysis is required.

Remedies where the contract is voidable

5.96 If a contract is voidable, it remains valid unless and until it is rescinded by the party who has the power to do so. Once rescinded, the contract is set aside from the start and the parties are restored to the position they were in before the contract was made. Rescission does not necessarily require an order from the court. In some cases a party can rescind a contract simply by informing the other party that the contract is rescinded, or, where that is not possible, by making clear through any other act that the contract is rescinded.[499] In practice, however, if the claimant's entitlement to rescind the contract is disputed by the other party, the court will need to decide the matter. The court's assistance may also be required to facilitate the unwinding of the contract.

5.97 As the purpose of rescission is to unwind the contract, the right to rescind cannot be exercised unless the parties can be restored to their pre-contractual positions.[500] Traditionally, courts in this jurisdiction enforced this requirement strictly, so that, unless the performance of the contract could literally be unwound, rescission was

---

496 *Quoine* at [133].

497 *Quoine* at [133].

498 *Quoine* at [134] to [135].

499 The right to rescind a contract for fraudulent misrepresentation and duress arises at common law, and does not require an order from the court. In contrast, the right to rescind a contract for non-fraudulent misrepresentation or undue influence arises in equity. The authorities are unclear on whether a contract can be rescinded in equity by an election by the claimant, or only by an order of the court: see C Mitchell, P Mitchell, S Watterson (eds), *Goff & Jones: The Law of Unjust Enrichment* (9th ed 2016) paras 40-11 to 40-12.

500 There are other bars to rescission. These include: (1) where the claimant, despite becoming aware of the vitiating factor, decides to affirm the contract; (2) where there has been such a delay by the claimant in seeking rescission that it would be unjust to permit rescission; and (3) where property transferred under the contract has been purchased by a third party, without notice of the vitiating factor rendering the contract voidable. In cases of non-fraudulent misrepresentation, the court also has a discretion to refuse rescission and order damages in lieu if it considers "that it would be equitable to do so", having regard to the nature of the misrepresentation, the loss caused to the claimant if the contract were upheld, and the loss that rescission would cause to the defendant: Misrepresentation Act 1967, s 2(2).

barred and the contract remained valid.[501] However, the modern approach is to permit rescission so long as the court can achieve "practical justice" between the parties, and that restoration to the parties' pre-contractual positions should be "substantial rather than precise".[502] For example, in *O'Sullivan v Management Agency and Music Ltd*,[503] the Court permitted the claimant to rescind a management services contract, even though the services performed by the defendant under the contract could not literally be restored to the defendant. Restoration could be achieved by requiring the claimant to pay the defendant a sum of money representing the value of the services.[504] Given that almost any benefit provided under a contract can be valued in money, it appears that rescission will rarely be barred on the basis that restoration is impossible.

5.98 Where a smart legal contract is voidable on the ground of misrepresentation, duress or undue influence, a party to the contract may seek rescission of the smart legal contract. We think that the existing legal principles of rescission can be applied to smart legal contracts without difficulties, and the majority of consultees agreed.[505]

5.99 However, if the smart legal contract has been partly or wholly performed by code, the question arises as to how the parties can be returned to their pre-contractual positions. In particular, some authors have noted that, if the code of a smart legal contract has performed transactions on a blockchain, those transactions may not be capable of literally being unwound because they are recorded on an immutable distributed ledger.[506] Dr Herian thought that the autonomous nature of smart legal contract processes may make rescission difficult: the lack of human intervention means the contract cannot be stopped from performing.

5.100 It is true that the blockchain itself could not be amended to reverse the effects of the code's performance. However, there may be other ways in which the court could achieve "practical justice" between the parties. There are several options available.[507]

---

501 This was the case where the right to rescind arose at common law. See for example, *Clarke v Dickson* (1858) EB & E 148, where the claimant was refused rescission of a contract to purchase shares in a partnership, because the partnership had been converted into a limited liability company, making it impossible for the claimant to return shares "in a partnership" to the defendant. See also *Vigers v Pike* (1842) 8 CL & Fin 562, where the Court refused rescission of a lease of a mine, because the claimant had extracted minerals from the mine, making it impossible for the mine to be returned to the defendant in its original condition.

502 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 9-133.

503 [1985] QB 428.

504 See also *Smith New Court Securities Ltd v Scrimgeour Vickers (Asset Management) Ltd* [1994] 1 WLR 1271; *Halpern v Halpern (No 2)* [2007] EWCA Civ 291, [2008] QB 195.

505 We asked consultees if they were aware of, or foresaw, any difficulties in applying the legal principles concerning rescission to smart legal contracts which have been vitiated for misrepresentation, duress or undue influence: call for evidence, question 36 at para 5.79.

506 See M Durovic and A Janssen, "Formation of smart contracts under contract law" in L DiMatteo, M Cannarsa and C Poncibò (eds), *Smart Contracts, Blockchain Technology and Digital Platforms* (2020) p 73; P Paech, "What is a smart contract?" *Oxford Business Law Blog* (2018).

507 N Yeo and A Taylor, "Avoiding blockchain contracts" (2019) 9 *Butterworths Journal of International Banking and Financial Law* 586.

(1) The court could order the parties to enter into an "equal and opposite" second transaction on the blockchain. The first transaction would remain on the blockchain, but its effects would be reversed by the second transaction.

(2) The court could identify the benefits transferred by the code, value those benefits in money, and then order the parties to make restitution to each other of the value of those benefits. While the precise benefits transferred by the code (for example, a token transferred by Alice to Bob) would not be restored, the value of those benefits would be, so that practical justice is achieved between the parties.

5.101 As the Chancery Bar and Commercial Bar Association said, even if the remedy is not rescission in a "strict legal sense", "in practical terms the result is the same, and this may well be sufficient in the majority of cases". The precise nature of the order fashioned by the court will likely depend on various factors, including the type of smart contract platform, and whether the code has already fully performed. DLA Piper UK agreed with "the proposed suggestions of other ways the court could achieve 'practical justice' between the parties", and noted that a "'one size fits all' approach is unlikely to be possible". For example, if the platform involves a central administrator, the central administrator may have the power to reverse or cancel transactions and thereby restore benefits transferred by the code to the parties' respective transaction accounts. This is what happened in *Quoine*, where the platform operator purported to cancel the bitcoin transactions upon being notified of them.[508]

5.102 Dr Robert Herian was of the view that the bars to rescission (particularly affirmation and delay) were particularly relevant in a smart legal contract context.[509] In his view, the efficiency gains with regard to performance, and the speed with which transactions occur, mean that rescission may be difficult to obtain in practice. The application of rescission in practice could be more complex in the context of smart legal contracts, but we do not think this means that the existing principles cannot be applied to those contracts, or that reform is needed.

5.103 Herbert Smith Freehills pointed out that further difficulties might arise where rescission is sought of a contract that was entered into pseudonymously. While we agree that pseudonymous contracting may make it more difficult to achieve rescission in practice, we do not think this is a concern unique to rescission, but rather one that applies generally to remedies in the smart legal contract context. It is also not a concern with existing legal principles, but rather with the practicalities of being able to enforce a remedy.

BREACH OF CONTRACT

Overview

5.104 A party commits a breach of contract when it fails to perform the contract in accordance with its terms. Where a contract is breached, the innocent party may

---

[508] However, the Singapore Court of Appeal held that the platform operator had acted in breach of its terms and conditions in doing so.

[509] The bars to rescission are discussed from para 5.97, at fn 500.

obtain a remedy. The principal remedy is compensatory damages,[510] which aim to put the innocent party, so far as money can do, in the position it would have been in had the contract been performed according to its terms.[511] Depending on the nature of the breach and the terms of the contract, the innocent party may be entitled to terminate the contract, in addition to claiming damages. In exceptional cases, where damages are an "inadequate" remedy,[512] the innocent party may seek an order of specific performance, which compels the party in breach to perform its obligations under the contract.[513]

5.105 Below we consider how the principles of repudiatory breach can be applied to smart legal contracts, and how the remedies for breach of contract can be applied where the code merely automates performance of the natural language obligations. We also consider how a breach of contract can be established in relation to smart legal contracts where the contractual obligations are (wholly or partly) defined in, and performed by, code, and the remedies that may be awarded following such breach.

Repudiatory breach in the context of smart legal contracts

5.106 A party repudiates the contract if that party makes clear to the innocent party, by their words or conduct, that they are:[514]

(1) not going to perform the contract at all;

---

510 That is, damages which compensate the claimant for the loss they have suffered as a result of the breach of contract. In exceptional cases, an account of profits for breach of contract may be awarded by reference to the gain made by the defendant as a result of the breach: see *Attorney-General v Blake* [2001] 1 AC 268, [2000] 3 WLR 625.

511 *Robinson v Harman* (1848) 1 Exch 850, 855. In seeking to put the claimant into as good a position as if the contract had been performed, there are different measures of compensation. In general, a court may award the claimant the "difference in value" or the "cost of cure". The former is the difference between the claimant's position after breach, and the position the claimant would have been in had the contract been performed. The latter is what it will, or has, cost the claimant to be put into as good a position as if the contract had been performed. The claimant, instead of directly claiming its lost profits, can alternatively claim its reliance loss. However, as the aim is still to put the claim into as good a position as if the contract had been performed, two features follow. First, the claimant cannot escape from a bad bargain. Second, even pre-contractual expenses may be recoverable. See A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) pp 124 to 129; A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 75. The Supreme Court has recognised that damages in certain cases may be assessed on the basis of what the claimant could reasonably have charged the defendant to commit the breach in question ("negotiating damages"). These damages are designed to compensate the claimant for the loss of an economically valuable asset protected by the contract: *Morris-Garner v One Step (Support) Ltd* [2018] UKSC 20, [2019] AC 649.

512 The main circumstance where damages are inadequate is where the subject matter of the contract is unique, such as a piece of land or a physically unique good: A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) pp 156 to 157.

513 Specific performance is an equitable remedy. Even if damages are inadequate, the court will not order specific performance if, for example, the contract is one for the provision of personal services, if the order would require constant supervision by the court, if performance would be physically or legally impossible, or if performance would entail severe hardship for the defendant: A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 156.

514 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 115.

(2) going to commit a breach of a condition;[515] or

(3) going to commit a breach of a term which is neither a condition nor a warranty (an "innominate" or "intermediate" term), and the consequences of the breach will be such as to deprive the innocent party of substantially the whole benefit of the contract.[516]

5.107 The repudiation may occur on or after the due date for performance, or prior to the due date for performance.[517] The latter case is generally known as "anticipatory repudiation", in which case the innocent party may (without waiting for the due date for performance) elect to accept the repudiation, thereby terminating the contract and becoming entitled immediately to claim damages for breach.[518]

5.108 Suppose Alice and Bob decide to enter into a smart legal contract in terms of which Bob agrees to pay Alice for certain goods. The smart legal contract is structured such that Alice (as seller of the goods) is bound to load the goods onto a ship nominated by Bob (as buyer of the goods). It is a term of the contract that Bob must nominate the ship suitable for loading by a certain date. Once Alice receives notification of the relevant ship for loading, Alice will load the goods onto the ship. Upon submission of proof that the goods have been loaded, the smart legal contract will automatically transfer the purchase price to Alice. However, Bob (in breach of contract) only gives notice of the readiness of the ship for loading a few days after the cut-off date. Alice is therefore unable to load the goods for sale. In this case, Alice can argue that the breach of contract by Bob is a breach of a condition, entitling Alice to terminate the smart legal contract and claim damages. The term is of material significance to the contract because, without its fulfilment, Alice cannot load the merchandise for sale onto the relevant ship. In other words, breach of the term deprives Alice of substantially the whole benefit of the contract.[519]

5.109 It is conceivable that not all forms of repudiatory breach may be common in the smart legal contract context. For example, since smart legal contracts are performed automatically without the need for human intervention, a repudiatory breach in the form of a refusal to perform the contract at all on or after the due date for performance

---

515 A "condition" is a term of such importance that any breach of it would deprive the claimant of substantially the whole benefit of the contract. In contrast, a "warranty" is a minor term, the breach of which would never deprive the claimant of substantially the whole benefit of the contract. See A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 115.

516 For an example of a case where a term was classified as an innominate term, see *ARK Shipping Company LLC v Silverburn Shipping (IoM) Ltd* [2019] EWCA Civ 1161, [2019] 2 CLC 57. In this case, the question before the Court was whether an obligation to keep a vessel in a particular classification was a condition or an innominate term. The term was not expressed to be a condition. The Court found that considering the language, structure, and scheme of the charterparty, together with business common sense, the obligation was best classified as an innominate term. The Court reasoned that the "advantages of certainty, achieved by making the term a condition, were clearly outweighed by the risk of trivial breaches having disproportionate consequences, so it was properly to be regarded as innominate".

517 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 116.

518 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) pp 115 to 116.

519 This example is based on the facts of *Bunge Corporation v Tradax Export SA Panama* [1981] UKHL 11, [1981] 1 WLR 711.

may be unlikely to occur in practice. Even so, we can envisage a situation where "anticipatory repudiation" occurs in advance of the due date for performance.

5.110 Suppose Alice and Bob decide to conclude a series of transactions via a piece of code deployed on Ethereum. Ethereum charges a fee based on the amount of computing power required to effect transactions.[520] In an accompanying natural language contract, Alice (unconditionally) promises to pay the fees to Ethereum in respect of the transactions. If Alice does not pay the requisite fees, the transactions are unlikely to take place. Alice sends an email to Bob in advance of the due date for performance telling him that she no longer intends to pay the required fees, which are greater than the amount she originally had in mind. In this case, Bob could argue that Alice's conduct amounts to "anticipatory repudiation" of the contract. The argument would be that, through her words, Alice has made clear to Bob (in advance of the due date for performance) that she is not going to perform the contract at all. This is because in the absence of payment of the fees, the code will not execute, and Alice's obligations under the contract will not be fulfilled.[521] The anticipatory repudiation entitles Bob to terminate the contract at once; he does not have to wait for the due date for performance.

5.111 We see no reason why the existing principles of repudiatory breach cannot be applied to smart legal contracts, including those with coded terms. Even though it might be the case that certain types of repudiatory breach are less common in the smart legal contract context, such as a failure to perform on the due date, this does not lead to a difficulty in applying existing legal principles. Instead, it is simply a practical consequence of the unique nature of contracts that are performed automatically by computer code.

Breach of contract where natural language obligations are performed by code

5.112 As we explain in Chapter 2, smart legal contracts can take a variety of forms, depending on the role played by the code.[522] One form of smart legal contract is a natural language contract with automated performance by code. In these smart legal contracts, the obligations of the parties are defined by the terms of the natural language contract. The code is merely a mechanism employed by the parties to perform those obligations. In principle, if the code fails to perform, or defectively performs, the obligations of one of the parties under the natural language contract, that party may be liable for breach of contract.

5.113 It is well established in the law of England and Wales that liability for breach of contract is generally strict;[523] a party to a contract is bound to produce the result promised in the contract. As such, regardless of whether a party's contractual obligations are to be performed automatically by computer code or through traditional

---

520 This is known as "gas": see A Antonopoulos and G Wood, *Mastering Ethereum: Building smart contracts and DApps* (2018) ch 1, https://github.com/ethereumbook/ethereumbook/blob/develop/01what-is.asciidoc.

521 This example assumes that Alice could not (and would not) have otherwise fulfilled her obligations under the smart legal contract through traditional performance.

522 We discuss the three forms of smart legal contract in more detail from para 2.51.

523 E Peel (ed), *Treitel on the Law of Contract* (15th ed 2020) para 17-065. The principle of strict liability may be modified by the terms of the contract. For example, the parties may include a "force majeure" clause which relieves the parties from their liability to perform due to the occurrence of a subsequent event.

performance, that party would be liable under the contract for any failures or defects in the performance of those obligations.

5.114 Below we consider how the legal principles concerning damages, termination and specific performance might be applied where the code fails to perform a natural language contract in accordance with its terms.

Damages

5.115 We consider that the existing principles of awarding damages for breach of contract should not create difficulties where the terms of a natural language contract are performed automatically by computer code, and consultees generally agreed.[524] Suppose Alice and Bob enter into a natural language contract under which Alice promises to transfer a token to Bob on 1 January for the price of 10 Ether.[525] The parties agree that the transaction will take place on Ethereum: Bob will send the Ether to a computer program deployed by Alice, and the program will automatically transfer the token to Bob on 1 January. Bob sends the Ether to the program, but due to a bug in the program, the program sends the token to Chris, instead of to Bob. On 2 January, Bob decides to purchase an equivalent token from another party, but the best price he can obtain for the token on Ethereum is 20 Ether. Alice returns the 10 Ether to Bob, but Bob proceeds to sue Alice, claiming damages for breach of contract.

5.116 In principle, Bob may be able to obtain damages for breach of contract in this example. As a result of the defective performance of the code, Alice breached her obligation under the natural language contract to transfer the token to Bob on 1 January. Bob lost the opportunity to obtain the token for 10 Ether, and instead had to spend 20 Ether to obtain the token. Bob is therefore entitled to damages of 10 Ether (or its equivalent in fiat currency), being the additional cost incurred by Bob to obtain the performance Alice had promised.[526] This remedy would place Bob in the same financial position he would have been in had the code properly performed Alice's obligation under the natural language contract.

5.117 Stephan Smoktunowicz thought that a "practical difficulty" may arise in that a party "to a coded or part coded contract will not want to be responsible" for a breach of contract caused by something "which is likely to be outside of their control". In general, no party wants to be held liable for breach of contract where the breach has been caused by an event outside of their control, but that is the effect of the law. We do not think the argument has any additional force in the context of smart legal contracts; the same concerns would arise in the context of traditional contracts. Breach of contract is generally strict. It is not open to a party to evade liability for breach of contract

---

524 We asked consultees if they were aware of, or foresaw, any difficulties in awarding damages for breach of contract where the terms of a natural language contract are performed automatically by computer code: call for evidence, question 37 at para 5.91.

525 We also used this example in the call for evidence, at para 5.86.

526 This method of assessing damages is known as the "cost of cure": see *Tito v Waddell (No 2)* [1977] Ch 106; *Radford v de Froberville* [1977] 1 WLR 1262; but see *Ruxley Electronics and Construction Ltd v Forsyth* [1996] AC 344 (damages based on the cost of cure were refused because the Court found that the claimant had no intention to incur the cost of cure, and awarding the cost of cure would have been unreasonable in the circumstances).

because the event is outside that party's control, unless the provisions of the contract provide otherwise, or the event is such that it invokes the doctrine of frustration.[527]

5.118 This point goes further than damages, and relates to all remedies for breach of contract. DLA Piper UK agreed 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.

Similarly, Linklaters said:

> 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.

5.119 As they noted, "there is nothing novel about this". In any case, in practice, the parties may include terms in the natural language contract which seek to limit or exclude their liability for breach of contract arising from performance of the code. Subject to the provisions of the Unfair Contract Terms Act 1977,[528] commercial parties are free to agree to terms which exclude or limit their liability for breach of contract.[529] In contracts entered into between businesses and consumers, the CRA 2015 requires that contracts must be fair, in that they must not cause a significant imbalance in the parties' rights and obligations to the detriment of the consumer.[530]

5.120 The Chancery Bar and Commercial Bar Association (joint response) said that there may be circumstances where "automatic performance could present difficulties in establishing the facts necessary to make a proper assessment of damages". However, they said that "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)."

5.121 We do not think that calculating damages in this context will give rise to unprecedented difficulties. Where all contractual terms are embodied in the natural language document, any damages resulting from breach of those obligations (even if due to the automatic performance of the code) can be determined in accordance with the existing principles for assessing damages. DLA Piper UK similarly thought that (other than in circumstances where liability has been validly excluded):

---

527 We discuss frustration from para 5.157.

528 See Unfair Contract Terms Act 1977, ss 2, 3, 6 and 7.

529 In addition, the parties may include a "force majeure" clause which excuses one or both of the parties from performing their obligations under the contract if a specified event occurs. We discuss force majeure clauses in more detail from para 5.169.

530 Consumer Rights Act 2015, s 62 and see Chapter 6 for a fuller discussion of consumer protection provisions. The 2015 Act also sets out terms which may be considered unfair, including terms which inappropriately exclude or limit the legal rights of the consumer in the event of total or partial non-performance or inadequate performance by the business: s 63 and sch 2, part 1, para 2.

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.

5.122 In any event, to assist with difficulties in calculating damages, parties may also include terms which stipulate a sum that is to be payable as damages in the event of a breach of contract. The court will enforce these terms upon breach, but not if the term amounts to a penalty. A penalty is a term which imposes a detriment on the defendant which is out of all proportion to any legitimate interest of the claimant in the performance of the contract.[531]

Termination

5.123 In some cases, breach of the natural language contract may entitle the innocent party to terminate the contract, in addition to claiming damages. The innocent party has the right to terminate the contract for breach by the other party where there has been a breach of a term that is a condition,[532] a breach of an innominate term (and the consequences are such as to deprive the claimant of substantially the whole benefit of performance),[533] or where the other party repudiates the contract.[534] All three scenarios are commonly referred to as "repudiatory breach".[535] Alternatively, the natural language contract may expressly include a termination clause entitling a party to terminate the contract in a situation where there would otherwise be no right to do so.[536]

5.124 We see no reason why a natural language contract, the performance of which is automated by code, could not be terminated for breach. Consultees generally agreed, subject to their comments on the practical challenges below. [537] As in the case of a traditional contract, the innocent party could elect to terminate the natural language contract by making clear, either through their words or conduct, that the contract is at an end. The effect of termination would be that (subject to contrary agreement) the parties are discharged from performance of their remaining obligations under the

---

531 See *Cavendish Square Holding BV v Talal El Makdessi* [2015] UKSC 67, [2016] AC 1171 at [32]. In accordance with this test, a term will not be a penalty if it is a genuine pre-estimate of the loss that the claimant will suffer as a result of the breach.

532 A "condition" is a term of such importance that any breach of it would deprive the claimant of substantially the whole benefit of the contract. In contrast, a breach of a mere "warranty" does not give rise to a right to terminate, but only a right to damages. A warranty is a minor term, the breach of which would never deprive the claimant of substantially the whole benefit of the contract. See A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 115.

533 A term which is neither a condition nor a warranty is an "innominate" term. Breach of an innominate term may confer a right to terminate if, in the circumstances, the consequences of the breach deprive the innocent party of substantially the whole benefit of the contract. See *Hongkong Fir Shipping Co Ltd v Kawasaki Kisen Kaisha Ltd* [1962] 2 QB 26; A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 115.

534 We discuss repudiation from para 5.106.

535 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 118.

536 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 122.

537 We asked consultees if they were aware of, or foresaw, any difficulties in applying the legal principles concerning termination where the terms of a natural language contract are performed automatically by computer code: call for evidence, question 38 at para 5.95.

contract. Professor Hugh Beale pointed out that termination may be of "little practical significance" where performance has already occurred before the breach is identified. We agree, but this may also be the case with traditional contracts. As we discuss below, the bigger challenge may be in effecting termination when the code has not yet fully executed.

5.125 We do not consider that these practical difficulties mean that the law on termination cannot be applied to smart legal contracts. As Linklaters said, "normal principles should apply, despite potential practical challenges in aborting contract code in some case". Katherine Graff made a similar argument.

Terminating performance as a practical matter

5.126 As a practical matter, the party who elects to terminate the contract may not have the power to terminate performance of the code, particularly if the code is recorded on an immutable distributed ledger.[538] This may lead to practical difficulties if the code continues to execute transactions or confer benefits after the contract has been terminated for breach.[539] As Stephan Smoktunowicz said:

> 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.

As discussed above, similar issues may arise in the context of rescission (although there we were concerned with unwinding transactions),[540] and in the context of rectification (although there we were concerned with amending coded terms).[541]

5.127 Professor Kelvin FK Low said that where the smart legal contract is "embedded on a blockchain, it cannot be terminated, at least not without someone having superuser privileges". We think the ability to assign the power to terminate performance of the code is more likely to be possible in the case of permissioned DLT systems, where such power can be assigned to a central administrator.

5.128 We understand that, in some cases, it may be possible for parties to design the coded element of a smart legal contract so that the parties themselves (or a third party) can initiate a "kill" or "self-destruct" mechanism, which terminates performance of the code.[542] The innocent party who elects to terminate the contract could potentially

---

538 Tech London Advocates, *Blockchain: Legal & Regulatory Guidance* (2020) p 43.

539 Benefits conferred by the code after discharge of the natural language contract for breach might be recoverable by the parties under the law of unjust enrichment, on the ground of failure of basis.

540 See from para 5.96.

541 See from para 5.14.

542 See D Futter and T Waters, "DLT in commercial contracts: an introduction to blockchain, DLT and smart contracts for commercial practitioners", *Practical Law* (2020); J Neuberger, W Choy, K Milewski, "Smart contracts: best practices", *Practical Law* (2020). See also T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 37 where the point is made that stopping the performance of a smart (legal) contract involves "relying on the contracting parties to integrate a kill switch in their design".

initiate this mechanism to ensure that performance of the code is also brought to an end when the natural language contract is terminated.

5.129 Trakti Ltd observed that the extent to which terminating code is an issue "depends on how the smart contract is implemented". They said this was because "there is no built-in termination logic in smart contract language". Instead, "the developer has to implement the logic and enforce access control on who can trigger the termination". Relatedly, the Digital Law Association said that "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". Any method of termination should, in their view, "be able to be accommodated by the chosen DLT system or platform".

5.130 Elsewhere in their response, DLA Piper UK referred to the work undertaken by the Hong Kong Monetary Authority ("HKMA") on smart contracts which envisages a concept similar to a "kill switch". A whitepaper published by the HKMA encourages the inclusion of mechanisms to halt performance of the code in situations beyond breach by one of the parties. It highlights:

> that programming/modelling errors and complex contract interdependencies can give rise to the risk of smart contracts failing to reflect the intention of the creator. Steps must therefore be taken to ensure that, if an undesirable consequence should occur, there is already a pre-agreed governance structure and contractual framework in place to handle the situation. Furthermore, the smart contract should contain an "escape hatch" enabling contracts to be modified or undone in the light of unforeseen eventualities.[543]

5.131 DLA Piper UK pointed out that allowing parties to terminate the code "might itself be open to abuse". They said this could be the case where, for example, "a party 'kills' the contract to avoid the execution of trades on unfavourable terms". Smart legal contracts may therefore give risk to potentially novel methods of breach (such as using a "kill" switch outside the terms of the contract). Even so, we do not consider that the risk of "efficient breach" is greater in the context of smart legal contracts than it is in the context of traditional contracts. In fact, we think the risk of such breach is likely to be lower in the vast majority of cases.[544] This is because the automaticity feature of smart legal contracts ensures that performance takes place automatically, without the need for (and indeed without the scope for) human intervention.

5.132 In any event, the ability to stop performance of the code may be necessary or desirable, both to accommodate termination for breach, and also to ensure

---

543 Hong Kong Monetary Authority, "Whitepaper 2.0 on Distributed Ledger Technology" (25 October 2017), https://www.hkma.gov.hk/media/eng/doc/key-functions/financial-infrastructure/infrastructure/20171025e1.pdf.

544 The basis of the economic theory of "efficient breach" is that, in a contract in which the claimant is to receive a contractual performance from the defendant in return for the payment of money, the claimant places a certain value on that performance. In order to support the efficient allocation of resources, the law must permit (and indeed encourage) a defendant to breach a contract where this will lead to resources passing to those who place higher values on them. See A Burrows, *Remedies for torts, breach of contract, and equitable wrongs* (4th ed 2019) p 413. See also T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 17 where the point is made that smart (legal) contracts deter opportunistic behaviour by preventing technical deviations from the initial agreement.

performance of the code is ended in other contexts discussed in this chapter, such as frustration.[545] Parties would be well advised to design the coded element of their smart legal contract such that performance of the code can be terminated if necessary. Thought will have to be given as to how best to structure this functionality so as to avoid any associated risk of abuse by one of the parties.

5.133 Herbert Smith Freehills made an interesting additional observation. They said that "difficulties may arise … where the triggering of a termination right is automated":

> 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 [smart legal contract] 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 [smart legal contracts]) entered into by the customer, meaning that it cannot now deliver the same widgets to one of its customers.

5.134 The point made by Herbert Smith Freehills is a useful and enlightening one. It demonstrates that parties need to pay careful attention to the elements they choose to automate.[546] As Herbert Smith Freehills said, parties will need to "be alive to the inadvertent consequences such automation may have"; "the current human application of decisions in relation to rejection and termination should not be under-estimated". Any "kill switch", whether automated or not, will need to be carefully devised.

Specific performance

5.135 In some cases, an award of damages may not be adequate to remedy the defective performance of the natural language contract by the code. As we have noted above, specific performance compels the party in breach to perform its positive obligations under the contract.[547] Suppose that Alice had promised under the natural language contract to transfer a token to Bob which represented ownership of a unique asset, such as a piece of art. If, for one reason or another, the code failed to transfer that token to Bob, Bob could potentially seek an order that Alice specifically perform her obligation under the contract to transfer the token to Bob. As in the case of a traditional contract for the sale of a specific piece of art, Bob's argument would be that an award of damages would not be an adequate remedy; Bob could not use a damages award to obtain a sufficient substitute because the piece of art is entirely unique. In principle, the court could order Alice specifically to perform her obligations by compelling her to deploy a new piece of code on the distributed ledger, which

---

545 We discuss frustration in more detail from para 5.157.

546 We discuss the suitability of automating certain obligations in Chapter 2 from para 2.18.

547 An award of specific performance is subject to various conditions being met: see A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 156.

corrects the defective performance of the old piece of code, and effects the transfer of the art.

5.136 Even though specific performance may be awarded where damages would not be an adequate remedy for the breach of contract, we think that an award of specific performance may be less common in the smart legal contract context. Where the terms of a natural language contract are performed automatically by computer code, the code performs without the need for human intervention. This feature of automaticity entails that, in practice, breach of contract is more likely to be in the form of defective performance, rather than non-performance of the smart legal contract. Specific performance may therefore be less common as a remedy because the nature of the breach is such that an award of damages will be sufficient to remedy the defective performance.

5.137 In addition, as the Digital Law Association said, "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". Even though we did not ask consultees a specific question about awarding specific performance in the context of smart legal contracts, nothing in their responses suggests an alternative analysis is required.

Breach of contract where contractual obligations are defined in code

5.138 In some cases, the coded element of a smart legal contract may not merely be a tool for performing the parties' contractual obligations. The code may also define the parties' contractual obligations, where the contract takes a solely code or hybrid form. Where the code is not merely a tool for performing the parties' contractual obligations, but instead also defines those obligations, it may be more difficult to establish a breach of contract. This is because establishing a breach of the coded terms of a smart legal contract is likely to first require the parties to establish the meaning of those terms, which can be a complex exercise.

5.139 In Chapter 4, we discuss the potential challenges in the interpretation of coded terms. We present two potential avenues for ascertaining the meaning of coded terms: what the coded terms "mean" to a functioning computer, or what the coded terms mean to a reasonable person with knowledge and understanding of code. We also explain how the test for interpreting coded terms affects a party's ability to argue a breach of those terms. Herbert Smith Freehills reiterated their view that smart legal contracts "concluded solely in code may present difficulties in formation and interpretation". These issues were said to, in turn, create "difficulties in ascertaining the existence and consequences of a breach of terms recorded in code".[548]

5.140 We consider that any difficulties that may arise in establishing a breach of the coded terms of a smart legal contract will primarily be in relation to interpreting those terms, rather than in applying the principles of breach once their meaning has been established. In some cases, an aggrieved party may allege that the code performed

---

[548] We asked consultees if they were aware of, or foresaw, any difficulties in in applying the legal principles concerning breach of contract to contracts recorded wholly or partly in computer code: call for evidence, question 39 at para 5.104. This question related to the questions we asked in Chapter 4 regarding the appropriate test for ascertaining the meaning of coded terms.

defectively, or not in accordance with what the terms "meant" on their proper interpretation. In this case, once the meaning of the coded terms has been settled, the court will be able to apply existing principles to determine whether a breach of the coded terms has occurred and, if so, to award the appropriate remedy. In other cases, such as that of repudiatory breach, the alleged breach may be more serious, but existing legal principles can still apply. In either case, as Allen & Overy said, "once an interpretation of the term is settled, there should be no novel issues as far as breach of contract is concerned".

5.141 We also do not foresee any difficulties in awarding remedies for breach of the coded terms of a smart legal contract. Once the meaning of the coded terms and the breach has been established, the exercise of awarding remedies for that breach should be the same as with a traditional contract, or a smart legal contract where the code is merely intended to perform natural language obligations. Returning to the example in para 5.115 above, suppose Alice and Bob enter into a hybrid smart legal contract. All the terms (including Alice's obligation to transfer a token to Bob on 1 January) for the price of 10 Ether) are defined by the code apart from a natural language choice of law and jurisdiction clause, contained as a non-executable comment in the code. The parties agree that Bob will send the Ether to a computer program deployed by Alice on Ethereum, and the program will automatically transfer the token to Bob on 1 January. Bob sends the Ether to the program, but due to a bug in the program, the program sends the token to Chris, instead of to Bob. Bob decides to purchase an equivalent token from another party, but the best price he can obtain for the token on Ethereum is 20 Ether. Alice returns the 10 Ether to Bob, but Bob proceeds to sue Alice, claiming damages for breach of contract.

5.142 In this case (as with the example where the obligation to transfer the token was contained in natural language) once a breach of the obligation has been established, Bob is entitled to entitled to claim damages. The coded nature of the obligation does not affect the application of existing principles once a breach of such obligation has been established.

POWER OF THE COURT TO SUSPEND PERFORMANCE OF THE CODE PENDING A DISPUTE

5.143 In response to the call for evidence, Herbert Smith Freehills said that the paper could usefully analyse the "jurisdictional basis for any enforcement and/or interim relief activities" undertaken by the courts of England and Wales in relation to smart legal contracts. For example, what powers (if any) may the court have to suspend the operation of a piece of code pending the final determination of a dispute?

5.144 Under rule 25 of the Civil Procedure Rules 1998, it is open to a court to grant a broad range of interim remedies to parties during the adjudication of a dispute. These include an interim injunction,[549] an order for the detention, custody or preservation of

[549] Civil Procedure Rules, r 25(1)(a).

property,[550] or an order (known as a freezing injunction) restraining a party from dealing with particular assets.[551] We discuss these possibilities below.

5.145 In terms of general observations, the power of the court to suspend performance of the code pending the outcome of a dispute will be heavily dependent on the facts of the particular case, including the agreement between the parties, and the nature of the dispute that arises. Given that suspending performance of the code is likely to entail restraining a party from performing their contractual obligations, we think such circumstances may be rare in practice. To avoid a scenario where the code performs pending the outcome of a dispute, parties would be well advised to provide for suspension of performance of the code in their smart legal contract (and the circumstances surrounding its activation), if such a right is desired.

Injunctions

5.146 The court's jurisdiction to grant injunctions is rooted in section 37 of the Senior Courts Act 1981. This section specifies that a court may "grant injunctions in all cases in which it appears to the court just and convenient to do so". Like an order for specific performance, an injunction is an equitable remedy.[552] A court may grant a prohibitory injunction which orders the defendant not to breach a negative contractual obligation.[553] Alternatively, if the defendant has already breached the contract, a mandatory injunction may be ordered to reverse the effects of the breach.[554] A mandatory injunction is generally more difficult to obtain than a prohibitory injunction, since it requires the defendant to perform (rather than refrain from performing) a particular act.[555] An order for a mandatory injunction is subject to a "balance of convenience" test,[556] and may be refused if the harm suffered by the defendant in having to restore the position outweighs the benefit to the claimant.[557]

5.147 Applications for interim injunctions are generally also subject to a "balance of convenience" test.[558] In particular, where an interim prohibitory injunction is sought, the claimant must show that there is a serious issue to be tried, and that the "balance of convenience" favours awarding the interim injunction.[559] In relation to the second question, the court will evaluate various factors, including: [560]

(1) the adequacy of damages as a final remedy for the claimant;

---

550 Civil Procedure Rules, r 25(1)(c)(i).

551 Civil Procedure Rules, r 25(1)(f)(ii).

552 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 161.

553 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 160.

554 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 163.

555 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 163.

556 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 30-076.

557 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 30-076.

558 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 30-078.

559 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 163.

560 *American Cyanamid Co (No 1) v Ethicon Ltd* [1975] UKHL 1, [1975] AC 396, 409, by Lord Diplock.

(2) whether the defendant will be sufficiently compensated through the claimant's cross-undertaking if the injunction is granted at the interim stage of proceedings, but the claimant ultimately loses at trial;

(3) whether the factual circumstances tilt the balance of convenience towards a particular party or favour maintaining the status quo; and

(4) any other consideration regarding the particular circumstances of the case.

5.148 The power of the court to suspend performance of the code pending the outcome of a dispute will depend on the specific facts of the case. Suppose Alice and Bob decide to enter into a hybrid smart legal contract. During initial natural language negotiations, the parties agree that the coded terms of the contract will provide for a digital asset to transfer automatically from Alice to Bob, provided Bob pays 100 Ether to Alice on 21 January 2022. Bob is responsible for coding the parties' agreement, and deploying the code on a smart contract platform. There are also natural language terms in the contract. These provide that Bob will activate the "suspension" function coded in the code in the event of any dispute arising in relation to the smart legal contract, and that the courts of England and Wales will have jurisdiction to adjudicate any such dispute. A "dispute" is defined to include a situation where one party commences legal proceedings against the other.

5.149 After the code has been deployed but before performance has taken place, Alice (during an audit of the code) discovers that the purchase price in the code is 50 Ether rather than 100 Ether, which was agreed to as part of the parties' prior, natural language negotiations. Bob, however, refuses to amend the coded terms as the error works to his advantage. Alice approaches a court seeking rectification of the coded terms on the basis that the price in the code fails to reflect the common intention of the parties as expressed in the parties' prior negotiations.[561] Alice requests Bob to halt performance of the code pending the outcome of the rectification dispute, as per the natural language terms of the contract. Bob, however, refuses to do so. Delayed delivery of the asset is inconvenient to Bob as he has promised to give the asset to his daughter as a gift on 22 January 2022.

5.150 In the above example, rather than approaching a court and seeking a mandatory injunction to compel Bob to "undo" the breach of contract, we think it would be more straightforward for Alice to seek an order of specific performance compelling Bob to perform his obligation to activate suspension of the code. Even though an order for specific performance cannot be made pre-trial,[562] the trial pertaining to the rectification involves a separate cause of action, quite independent from Alice's claim for specific performance based on a breach of the obligation to suspend the code. In other words, it is not the case that Bob's rights in relation to suspending performance of the code will only be established during the rectification dispute. In addition, granting an order of specific performance would not entail severe hardship for Bob; activating the suspension of the code is not an onerous obligation for him to perform.[563] However, the court will only award an order of specific performance if damages are not an

---

561 We discuss rectification of coded terms from para 5.4.

562 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 161.

563 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 156.

adequate remedy.[564] In this case, a court might take the view that damages will not provide Alice with adequate redress for Bob's failure to suspend performance of the code. Even though damages (or an award of the agreed sum) may be an adequate remedy for any breach by Bob to pay Alice the full purchase price (if the coded terms are rectified), this is a separate cause of action to the claim for specific performance.

5.151 However, if Alice and Bob have not provided for the suspension of performance of the code in their smart legal contract, a court will not be able to award an order of specific performance. In addition, it is difficult to see on what basis a court could order an injunction pending the outcome of the rectification dispute. A prohibitory injunction would not seem to be appropriate as there is no negative contractual obligation that Bob ought to be restrained from breaching. Similarly, there is no breach of contract by Bob, the effects of which need to be reversed such as to justify a mandatory injunction. A *quia timet* injunction, which is an injunction granted to prevent the occurrence of an actionable wrong but where no wrong has yet been committed,[565] also does not seem applicable on the facts. It is not clear what anticipated wrong the injunction would prevent.

Freezing orders

5.152 A freezing order is a type of prohibitory interim injunction issued by the court to ensure that the defendant's assets are available pending trial of the dispute, although such an order may also be sought after trial until enforcement is complete.[566] Returning to the example in paragraph 5.148, it appears unlikely that a freezing injunction would be either available or useful on the facts. First, the freezing order can only impose limits on Bob's assets, such as his bank accounts; it cannot be imposed on the code itself. Second, courts are generally circumspect about granting freezing orders, which will only be awarded where it is "just and convenient" to do so. Among other things, Alice would have to prove that she has a good arguable case, and provide evidence to demonstrate that Bob has assets which he is at risk of dissipating.[567] A freezing order does not seem applicable on the facts or relevant since we are concerned with preventing the transfer of Alice's assets to Bob, rather than with a transfer of Bob's assets.

UKJT DISPUTE RESOLUTION RULES

5.153 In April 2021, the UKJT published the first version of its Digital Dispute Resolution Rules ("UKJT Rules").[568] Sir Geoffrey Vos, Master of the Rolls, said that the UKJT Rules are to be "used for and incorporated into on-chain digital relationships and smart contracts," with a view to "facilitate[ing] the rapid and cost-effective resolution of

---

564 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 155.

565 *Elliot v Islington BC* [2012] EWCA Civ 56.

566 *Crowther v Crowther* [2020] EWCA 762 at [48] by Males LJ.

567 *Ninemia Maritime Corporation v Trave Schiffahrtsgellschaft MbH* [1983] 1 WLR 1421, [1984] 1 ALL ER 398, 1417 and 1421, by Kerr LJ.

568 UK Jurisdiction Taskforce, *Digital Dispute Resolution Rules* (2021) ("UKJT Rules"), https://35z8e83m1ih83drye280o9d1-wpengine.netdna-ssl.com/wp-content/uploads/2021/04/Lawtech_DDRR_Final.pdf.

commercial disputes" involving novel technologies.[569] The UKJT Rules can be incorporated into smart legal contracts by reference, or parties may agree to adopt them after a dispute arises.[570]

5.154 The UKJT Rules provide for rapid dispute resolution. In the first instance, they specify that the outcome of any automatic dispute resolution process,[571] which is increasingly common in the digital sphere, is binding.[572] In addition, they provide that any dispute which is not the subject of an automatic dispute resolution process shall be submitted to arbitration.[573] Expert issues will be determined by an appointed expert acting as such. The UKJT Rules also outline a faster timeline for the resolution of disputes. For example, after receiving a notice of claim, respondents have three days to file their initial response,[574] after which the "appointment body" must appoint the tribunal "as soon as practicable."[575] The tribunal shall (in the absence of a time period agreed to by the parties) use its "best endeavours" to give an outcome within 30 days from its appointment.[576] The tribunal is also given "absolute discretion" with regard to procedure, admissibility of evidence and submissions.[577]

5.155 The submission of disputes involving smart legal contracts to arbitration allows parties to benefit from a highly developed arbitration regime in England and Wales. Where the 16 broadly framed rules are silent, parties can use the Arbitration Act 1996 to access "sensible defaults".[578] Under the UKJT Rules, there is also no right of appeal on a point of law, and the only other challenges permitted are those available under the Arbitration Act 1996.[579] The UKJT Rules are governed by the law of England and

---

569 UKJT Rules, pp 3 to 5.

570 UKJT Rules at [3].

571 The UKJT Rules define an "automatic dispute resolution process" as "a process associated with a digital asset that is intended to resolve a dispute … by the automatic selection of a person or panel or artificial intelligence agent whose vote or decision is implemented directly within the digital asset system (including by operating, modifying, cancelling, creating or transferring digital assets)." A "digital asset" includes a smart (legal) contract. Some consultees raised the example of CodeLegit as a dispute resolution solution for smart legal contracts, although this no longer seems to be operational. Similar service providers, including Kleros, which is used by Ethereum, utilise automatic dispute resolution like processes to conduct blockchain arbitration for disputes involving smart legal contracts. For more information, see K Szczudlik, "'On-chain' and 'off-chain' arbitration: Using smart contracts to amicably resolve disputes" (4 June 2019), https://newtech.law/en/on-chain-and-off-chain-arbitration-using-smart-contracts-to-amicably-resolve-disputes/.

572 UKJT Rules at [4].

573 UKJT Rules at [5].

574 UKJT Rules at [7].

575 UKJT Rules at [8]. The "appointment body" is "the Society for Computers and Law".

576 UKJT Rules at [12].

577 UKJT Rules at [9]. The tribunal must exercise its discretion "fairly and impartially" while giving each party a "reasonable opportunity" to make their case.

578 UKJT Rules p 10.

579 UKJT Rules at [16].

Wales and, unless the parties specify otherwise, "disputes shall be resolved in accordance with the law of England and Wales".[580]

5.156 Disputes involving smart legal contracts can vary depending on, amongst other things, the type of smart legal contract, the underlying technology, the sophistication of the parties, and the factual background. The UKJT Rules appear particularly well-suited for disputes involving smart legal contracts. First, they make appropriate provision for the appointment of experts, which is particularly important in deciphering the meaning of coded terms.[581] Second, they include a consolidation rule, which addresses complex situations where "multiple different parties and potentially a number of different contracts" are involved, which all concern the "same or similar circumstances".[582] Third, they provide for the on-chain implementation of decisions. This means that the tribunal can enforce an award directly onto the smart legal contract using a private key.[583] To facilitate this, the tribunal is given wide powers to "operate, modify, sign, or cancel any digital asset relevant to the dispute".[584] Finally, in addition to the confidential nature of arbitration,[585] the UKJT Rules contain an option for anonymity, which is significant in the context of smart legal contracts where parties may wish to trade (and resolve disputes) anonymously.

FRUSTRATION

Overview

5.157 The doctrine of frustration concerns the situation where the parties have entered into a contract, but by reason of a subsequent event, performance has become physically or legally impossible, or something "radically different" from what was contemplated by the contract.[586] If a contract is frustrated, the contract is automatically terminated and the parties are excused from further performance under the contract.[587] The rationale for the doctrine is that it is unjust to insist on the literal performance of a contract after a radical change in circumstances.[588]

5.158 The effect of frustration is to terminate an otherwise binding contract. As such, the doctrine has a narrow scope. A subsequent event will not frustrate the contract if its

---

580 UKJT Rules at [16].

581 We discuss interpretation and the role of experts in Chapter 4 (Interpretation).

582 UKJT Rules p 14.

583 UKJT Rules at p 3.

584 UKJT Rules at [11].

585 *Ali Shipping Corporation v Shipyard Trogir* [1997] EWCA Civ 3054, 326, by Potter LJ.

586 *Davis Contractors Ltd v Fareham Urban DC* [1956] AC 696, 729, by Lord Radcliffe.

587 *National Carriers v Panalpina* [1981] AC 675, 700, by Lord Simon. Under the Law Reform (Frustrated Contracts) Act 1943, a party may claim restitution of benefits conferred prior to the frustrating event, provided that appropriate counter restitution is given for benefits conferred by the other party: see ss 1(2) and 1(3).

588 *J Lauritzen AS v Wijsmuller BV* [1990] 1 Lloyd's Rep 1, 8, by Bingham LJ; *National Carriers Ltd v Panalpina (Northern) Ltd* [1981] 1 AC 675, 700, by Lord Simon.

occurrence is due to the fault of one of the parties.[589] That the event merely makes performance of the contract more onerous or expensive for one of the parties is also not sufficient for frustration; the event must render performance of the contract physically or legally impossible or "radically different" from that contemplated by the contract.[590] Whether performance would be "radically different" is a fact sensitive enquiry, which depends on the terms of the contract itself and its context, the parties' mutual expectations as to risk at the time the contract was made, and the nature of the supervening event.[591]

5.159 The classic circumstance in which a contract is frustrated is where the subject matter of the contract is destroyed or the mutually understood purpose of the contract becomes impossible to achieve. For example, in *Taylor v Caldwell*,[592] the lease of a music hall was held to be frustrated because the hall subsequently burnt down, making it impossible to perform the contract. By contrast, in *Davis Contractors Ltd v Fareham UDC*,[593] the House of Lords held that a fixed price building contract was not frustrated where, due to an unforeseen labour shortage, the project could only be completed at great delay and expense. Lord Reid observed that the subsequent event had merely made performance of the contract more onerous; it had not fundamentally changed the nature of the building work contemplated by the contract.[594]

5.160 In many cases, the question of frustration is not reached because the consequences of the subsequent event are dealt with by the terms of the contract. It is common for commercial parties to agree to a "force majeure" provision. A force majeure provision typically identifies a range of subsequent events that might affect performance of the contract and specifies their effect on the contract and the remedies available to the parties.[595] If the subsequent event falls within a force majeure clause on its proper interpretation, the consequences of the event will be determined by reference to what the provision says; the doctrine of frustration will have no application.[596]

Frustration in the context of smart legal contracts

5.161 In the context of smart legal contracts, there is a risk that events beyond the parties' control may affect performance of the code.[597] If an event affecting performance of the code is not dealt with by the natural language terms, a party might argue that the

---

589 This is known as "self-induced frustration": A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 175; *J Lauritzen AS v Wijsmuller BV* [1990] 1 Lloyd's Rep 1, 8, by Bingham LJ.

590 *National Carriers Ltd v Panalpina (Northern) Ltd* [1981] 1 AC 675, 700, by Lord Simon.

591 *Edwinton Commercial Corporation v Tsavliris Russ (Worldwide Salvage and Towage) Ltd* [2007] EWCA Civ 547, [2007] 2 All ER (Comm) 634 at [111] by Rix LJ; *Canary Wharf (BP4) T1 Ltd & Ors v European Medicines Agency* [2019] EWHC 335 (Ch) at [31] by Marcus Smith J.

592 (1863) 3 B&S 826.

593 [1956] AC 696.

594 *Davis Contractors Ltd v Fareham UDC* [1956] AC 696.

595 For example, that the parties have the right to terminate the contract, that the contract is suspended for the duration of the subsequent event, or that neither party is to be liable for delay or non-performance as a result of the event.

596 A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) pp 175 to 176.

597 UKJT Legal Statement at [136].

smart legal contract is frustrated at common law. In principle, a smart legal contract could be frustrated where, by reason of a subsequent event, performance of the code becomes physically impossible. For example, if the platform on which the code is deployed is shut down due to some unforeseen event, this might be seen as a case involving the impossibility of performance due to destruction of the subject matter of the smart legal contract.

5.162 In other cases, the subsequent event might not prevent the code's performance, but might cause the code to execute in a way "radically different" from that contemplated by the contract. In principle, the doctrine of frustration could be applied in these circumstances. The task would be first to identify the subsequent event, then to determine if it rendered the code's performance "radically different" from what the contract contemplated and, if it did, to treat the contract as discharged from that point. Alternatively, and as in the case of traditional contracts, a subsequent change in the law might mean that something required to be done under the smart legal contract becomes legally impossible. In either case, the parties may seek to recover benefits which continue to be conferred by the code after the discharge of the frustrated smart legal contract under the law of unjust enrichment.[598]

5.163 We consider that the existing principles of frustration can accommodate smart legal contracts, even though they may give rise to new types of frustrating events. Herbert Smith Freehills observed that "there is no reason the basic criteria for frustration" cannot apply to smart legal contracts, even though the courts may have to "consider a number of new and different supervening events (for example, the failure/closure of a third party platform)".[599]

5.164 Catherine Phillips thought that there "could be challenges with the ability to terminate the contract if the code does not make appropriate provision for this". Where the smart legal contract is frustrated due to physical impossibility of performance (for example, if the platform unexpectedly shuts down), we think that termination of the contract, and subsequent performance of the code, is less likely to be a concern. The external event will have rendered performance of the code physically impossible. In contrast, where the smart legal contract is frustrated due to an external event rendering performance of the code legally impossible, or radically different from what was contemplated by the contract, any future performance of the code will need to be terminated. In these cases, difficulties might arise. However, we think this is a practical concern rather than a difficulty in applying the existing legal principles of frustration. Similarly, practical concerns may arise in relation to other remedies, such as termination for breach of contract, which we have discussed above.[600]

---

598 This is what was argued in *Davis Contractors Ltd v Fareham UDC* [1956] AC 696. The builder performed the contract, but claimed that it should be remunerated for the work on a restitutionary basis, rather than at the contract price, because the contract had been discharged for frustration. On the facts the Court found that the contract had not been frustrated. Any benefits conferred before the discharging event may be recovered under the Law Reform (Frustrated Contracts) Act 1943.

599 We asked consultees if they were aware of, or foresaw, any difficulties in applying the law on frustration to smart legal contracts: call for evidence, question 40 at para 5.112.

600 We discuss this from para 5.126.

Will frustration assume increased significance in the smart legal contract context?

5.165 We consider that frustration may assume greater significance in the smart legal contract context because of the range of factors, external to the parties' control, that could render performance of the code impossible or "radically different" from what was contemplated by the contract.

5.166 The Chancery Bar and Commercial Bar Association (joint response) said that frustration was likely to be relevant in cases where future performance of the code becomes impossible. They thought that, in circumstances where a smart legal contract has been performed "but with an outcome radically different from what the parties might have anticipated", "the tendency appears to be for such cases to be analysed by reference to the doctrine of mistake". The Chancery Bar and Commercial Bar Association provided *Quoine* as an example. They said that:

> 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.

5.167 We agree that mistake may also assume greater significance in the smart legal contract context, and may be argued in cases where the code has already performed but that performance is "radically different" from what the parties expected. Even so, we do not think that this necessarily renders frustration redundant in these cases. Common mistake, for example, is concerned with a common misapprehension which was present at the time of entry into the contract, whereas frustration is concerned with events which occurred *after* entry into the contract.[601] It is plausible that frustration may be relied upon in circumstances where, although the code has performed,[602] an external event following conclusion of the contract rendered that performance "radically different" from what was contemplated by the contract. In fact, we think that in most cases where frustration of this type is relied upon, the code would have already (partially) performed, as the parties would only be able to determine that performance was "radically different" once the code had performed.

5.168 For example, if the code performed in an unexpected way due to a system malfunction, the aggrieved party might try hold the other party liable for breach of contract, provided the other party's obligations were defectively performed due to the system malfunction. In such a case, the other party may argue that the contract was frustrated to absolve themselves of liability. The argument would be that an external event, which was outside the control of that party, rendered performance "radically different" from what was contemplated by the contract and, as such, the contract was discharged from that point due to frustration. In these circumstances, we anticipate frustration (in relation to past performance of the code) being argued more frequently. However, it is worth noting that the doctrine is "not lightly to be invoked to relieve

---

601 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 26-002.

602 Frustration was argued in *Davis Contractors Ltd v Fareham UDC* [1956] AC 696 after the contract had been performed, although on the facts the Court found that the contract had not been frustrated.

contracting parties of the normal consequences of imprudent commercial bargains".[603] Frustration has a narrow scope under the law of English and Wales, and will only be established in such a case if:

> without default of either party a contractual obligation has become incapable of being performed because the circumstances in which performance is called for would render it a thing radically different from that which was undertaken by the contract.[604]

Terms parties may include to address the risk of subsequent events

5.169 Parties to a smart legal contract would be well advised to draft detailed provisions that deal with the risk of external events beyond the parties' control affecting performance of the code. In the call for evidence, we asked consultees to provide examples of terms that parties have included (or might include) in the natural language element of their smart legal contract to address this risk.[605] We asked consultees to explain the drafting of the provision, the subsequent events covered by the provision, the effect of the subsequent event on the contract, and the remedies available to the parties under the provision.

5.170 Linklaters said that the drafting of provisions to address the risk of subsequent events affecting performance of the code "will vary dramatically depending on the circumstances and the risk allocation agreed between the parties". Stephan Smoktunowicz similarly said that provisions will need to be drafted on a "case by case basis" to reflect, for example, the technology being used, and the level of control (if any) the parties have over that technology.

5.171 Herbert Smith Freehills provided examples of terms that parties may include in the natural language element of their smart legal contract to address the risk that subsequent events might affect the performance of the code. These included a term to "address the situation where coded terms or linked data sources do not perform as expected", a term to "deal with variations (including unintended variations)" of the code, and a term to deal with platform malfunctions. In relation to a term covering unintended variations of the code, Herbert Smith Freehills suggested that such a term should address "a mechanism for rolling back to an earlier contract state", and "abortion or reversion of specific processes" to remedy "the outcome of malfunctioning code". In relation to a term covering platform malfunctions, they suggested that such a term should address "what degree of loss of functionality is required", and whether the "smart legal contract should be able to 'roll-back' to only the natural language provisions or be exported to another platform". Catherine Phillips referred to the Loan Market Association facility agreements, which she said contain "fallback provisions in the event a particular oracle is not available on either a temporary or long-term basis".

5.172 Both Herbert Smith Freehills and Allen & Overy noted the importance of parties drafting provisions in natural language to deal with the impact of supervening events on their smart legal contract. Hebert Smith Freehills pointed out that, "while this could

---

603 *Pioneer Shipping Ltd v BTP Tioxide Ltd (The Nema)* [1982] AC 724, 752, by Lord Roskill.

604 *Davis Contractors Ltd v Fareham UDC* [1956] AC 696, 729, by Lord Radcliffe.

605 Call for evidence, question 41 at para 5.113.

be done in non-executing 'explanatory' language in the code",[606] this may "pose practical difficulties in identifying and interpreting the terms of the force majeure provision". Instead, they said that they expect parties to include the details of such terms in the "natural language portion of their smart legal contracts".

ILLEGALITY

5.173 Under the law of England and Wales, if the purpose or performance of a contract involves conduct that is illegal, then the contract may not be enforced by a court. A rationale for this principle (known as the "illegality doctrine") is that it would be contrary to the public interest to enforce a claim if doing so would harm the integrity of the legal system.[607] Whether a claim falls within the scope of the illegality doctrine depends on:[608]

(1) the underlying purpose of the law that has been transgressed and whether that purpose would be enhanced by refusing to enforce the claim;

(2) any other relevant public policy which may be affected by denying the claim; and

(3) whether refusing to enforce the claim would be a proportionate response to the illegality, bearing in mind that punishment is a matter for the criminal courts.

5.174 A concern sometimes expressed about smart contracts is that they may facilitate illegal activity.[609] As discussed in Chapter 3,[610] some DLT systems enable the parties to transact using pseudonyms, without disclosing their real identities. Further, DLT enables participants to transact directly with one another without the need for intermediaries, such as banks, who would traditionally play a role in detecting illegal activity. Finally, the effective immutability of data on some DLT systems may make it difficult for authorities to halt performance of the code, even once the illegal activity is detected.

5.175 If a party were to bring a claim under a smart legal contract which was tainted by illegality, the ability to enforce that claim would depend on the court's evaluation of the three considerations outlined above. Since the coded element of a smart legal contract performs automatically, it is perhaps unlikely that a party would ask a court to enforce the smart legal contract. It seems more likely that a party might bring a restitutionary claim to recover money or property transferred under a smart legal

606 We discuss the possibility of incorporating contractual terms as comments in the code from para 2.51(2).

607 *Patel v Mirza* [2016] UKSC 42, [2017] AC 467 at [120] by Lord Toulson.

608 *Patel v Mirza* [2016] UKSC 42, [2017] AC 467 at [120] by Lord Toulson.

609 See, for example, P de Filippi and A Wright, *Blockchain and the Law: The Rule of Code* (2018) pp 86 to 88 (noting that smart contracts could be used to enter into commercial transactions for the sale of illicit products, for illegal gambling, and for money laundering).

610 We discuss this from para 3.19.

contract tainted by illegality.[611] In *Patel v Mirza*,[612] the UK Supreme Court allowed an unjust enrichment claim to recover money paid under an agreement amounting to a conspiracy to commit insider dealing, even though that agreement was tainted by illegality.[613]

5.176 We consider that the existing principles of the illegality doctrine can apply to smart legal contracts, and that "no specific modification" is necessary to accommodate smart legal contracts, as Allen & Overy put it.[614] They said that, if a court is asked to enforce a cause of action relating to illegal conduct in relation to a smart legal contract, "the current doctrine as laid out in cases such as *Patel v Mirza* can be applied".

5.177 The Chancery Bar and Commercial Bar Association (joint response) provided the example of a claim based 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". In this case, they said there should be no "conceptual difficulty" in applying the illegality doctrine. Any difficulties that did arise would, in their opinion, "be to a significant degree evidential", and seem to "result largely from the lack of transparency" associated with some smart legal contracts. D2 Legal Technology made the point that the risks associated with illegality, and the application of associated laws and doctrines, can be mitigated through the use of "private distributed ledgers and model clauses".

5.178 Cuneyt Eti queried how a finding of illegality would result in halting transactions on a distributed ledger, which were said to be traditionally "free from the governance of legacy authorities". As discussed in Chapter 2, in this paper we are concerned with smart legal contracts which are legally binding, rather than with smart contracts where the parties consider that "the code is law". In terms of halting performance of the code after a finding of illegality, we think this is a practical difficulty rather than a difficulty in applying existing legal principles. We have discussed similar issues above, including in relation to termination for breach of contract.

5.179 In addition, the doctrine of illegality is concerned with the court refusing to enforce contracts. A party may be unlikely to need to seek to enforce performance of a smart legal contract given that the code performs automatically. Allen & Overy pointed out that "the doctrine of illegality concerns the courts not helping to enforce a cause of action". As such, they said that the "real difference" that smart legal contracts may bring about is that the "assistance of the courts may be less needed in general if performance is (irrevocably) automatic". Relatedly, Linklaters said that there is a "distinction to be made between performance and enforcement". While a claim may be "unenforceable if it falls within the scope of the illegality doctrine", "it may nonetheless

---

611 For example, because the counterparty has failed to provide the promised counter-performance, so that there was a failure of basis for the conferral of the benefit: see *Patel v Mirza* [2016] UKSC 42, [2017] AC 467.

612 [2016] UKSC 42, [2017] AC 467.

613 See A Burrows, "Illegality after Patel v Mirza" 70(1) *Current Legal Problems* 55, 60 (noting that, following *Patel v Mirza*, it "will be rare for illegality to succeed as a defence to an otherwise successful claim for restitution of an unjust enrichment").

614 We asked consultees if they were aware of, or foresaw, any difficulties in applying the illegality doctrine to claims made in relation to smart legal contracts: call for evidence, question 42 at para 5.117.

be performed if, for example, there are practical difficulties in aborting the contract code". Similarly, Professor Hugh Beale said that the "doctrine of illegality is about refusing to enforce contracts, not about undoing ones that have already been performed".

5.180 Since the illegality doctrine is primarily concerned with the enforcement of illegal contracts, it may therefore play less of a role in the context of smart legal contracts where performance is automated.

Chapter 6: Consumers and smart legal contracts

6.1 Smart legal contracts need not be confined to transactions between businesses. Smart legal contracts can also be used in business to consumer transactions, as well as in consumer to consumer or "peer to peer" transactions. In this chapter, we discuss smart legal contracts entered into between businesses and consumers ("B2C smart legal contracts"). We begin by discussing how the existing consumer protection laws might be applied to smart legal contracts, focusing in particular on the requirement for transparency of written terms, the prohibition against unfair contract terms, and unfair commercial practices. We also consider the consumer's right to treat the contract as at an end. We consider whether the existing law provides adequate protection to consumers who enter into B2C smart legal contracts, and whether any reforms or additional protections may be required. We conclude by discussing some examples of B2C smart legal contracts currently in use or in development.

B2C SMART LEGAL CONTRACTS

6.2 Consultees commented on the current prevalence of B2C smart legal contracts.[615] Florien Idelberger said that, "in the world of decentralised finance they already are [common]". Lloyd's of London said that there are "many examples of parametric products that are already sold direct to consumers". They said that they "expect this market to continue to grow over time". A few consultees who ventured time estimates said that B2C smart legal contracts may become increasingly common over the course of the next few years.[616]

6.3 The Digital Law Association identified four conditions that, in their view, would have to be met before there was "widespread use" of B2C smart legal contracts, and before the benefits of using such contracts outweigh the risks.

(1) *Sufficient time and cost savings*: businesses are unlikely to invest in developing B2C smart legal contracts in the absence of proven efficiencies from their use. To the extent that B2C contracts contain obligations requiring the exercise of human judgement and discretion, they are unlikely to be good candidates for automation using smart contract technology.

(2) *Certainty of enforcement*: businesses are unlikely to use B2C smart legal contracts unless they are satisfied that they can be used consistently with consumer protection legislation. Unless businesses can be confident that B2C smart legal contracts are enforceable in the jurisdictions in which they operate

---

615 We asked consultees when, in their estimation, the use of B2C smart legal contracts might become more common: call for evidence, question 44 at para 6.6.

616 The questions we asked in the call for evidence were based on a narrower definition of "smart legal contract", in terms of which the smart contract had to be deployed on a DLT system to classify as a "smart legal contract". On the broader, technology-neutral definition of "smart legal contract" adopted in this paper, B2C smart legal contracts may already be common in practice.

(including but not limited to England and Wales), they may be reluctant to use them.

(3) *Access to reliable data*: businesses are unlikely to use B2C smart legal contracts unless accurate data can be transmitted to the smart legal contract from reliable sources. Such data may be more widely available in some sectors than in others.

(4) *Improved cooperation and standardisation of smart legal contract development*: given that developers are generally tasked with creating a smart legal contract "from scratch", businesses are unlikely to use B2C smart legal contracts on a large scale until agreed standards and open-source tools for the creation of smart legal contracts are developed.

6.4 We agree with the Digital Law Association that any business decision about whether to develop and use a B2C smart legal contract is likely to depend on various factors, including those mentioned. We note that efficiency considerations, the ability to access reliable data, and the availability of standards and open-source tools for the creation of smart legal contracts are factors which are likely to be relevant in determining whether to use a B2C smart legal contract. However, as the Digital Law Association observed, a unique consideration that arises in the context of B2C smart legal contracts is whether they can be used consistently with consumer protection laws. We now turn to that topic.

CONSUMER PROTECTION AND SMART LEGAL CONTRACTS

6.5 Under the law of England and Wales, specific consumer protections apply to "consumer contracts",[617] which are contracts entered into between a trader and a consumer.[618] These consumer protections are principally set out in the Consumer Rights Act 2015 (the "CRA 2015"), and in various regulations implementing EU Directives.[619]

Requirement for transparency in written terms

6.6 Under section 68(1) of the CRA 2015, a trader must ensure that the written terms of a consumer contract are transparent. In order to be transparent, the terms must be expressed in plain and intelligible language, and be legible.[620] The Court of Justice of the European Union (the "CJEU") has said that written terms should not only make grammatical sense to the average consumer,[621] but should also enable the consumer

---

617 A "consumer contract" is a contract between a trader and a consumer: Consumer Rights Act 2015, s 61(1) and (3).

618 "Trader" means a person acting for purposes relating to that person's trade, business, craft or profession, whether acting personally, or through another person acting in the trader's name or on the trader's behalf: Consumer Rights Act 2015, s 2(2). "Consumer" means an individual acting for purposes that are wholly or mainly outside that individual's trade, business, craft or profession: Consumer Rights Act 2015, s 2(3).

619 Including the Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013, SI 2013 No 3134 and the Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277.

620 Consumer Rights Act 2015, ss 64(3) and 68(2).

621 The "average consumer" is "a consumer who is reasonably well informed, observant and circumspect": Consumer Rights Act 2015, s 64(5).

to "evaluate, on the basis of clear, intelligible criteria, the consequences for him which derive from [the term]".[622] The failure by a trader to comply with the transparency requirement does not amount to a breach of contract, or make such a term unenforceable against the consumer. Further, the consumer cannot bring an action against the trader on the basis that the contract was not transparent. However, the Competition and Markets Authority (the "CMA") can use its enforcement powers to prevent traders from using terms which are not transparent.[623]

6.7 Guidance issued by the CMA states that, to be transparent, the written terms of a contract should be, among other things:[624]

(1) *jargon free*: written terms should, as far as possible, use ordinary words in their normal sense;

(2) *reader-friendly*: written terms should be organised so as to be easily understood;

(3) *comprehensible*: the meaning of the words or concepts used, as well as the reasons for them, should be explained if they are not capable of being readily understood by consumers;

(4) *informative*: a consumer should, on the basis of the information provided, be able to foresee and evaluate the consequences of the wording used; and

(5) *accompanied by pre-contractual literature*: the term should be accompanied by pre-contractual literature if, for instance, the contract is complex or lengthy.

6.8 The coded terms of a B2C smart legal contract may not be "transparent" to a non-code literate consumer in the absence of a natural language explanation of those terms. This is because the average consumer is unlikely to be able to read and understand code. From the consumer's perspective, code is unlikely to be readable, comprehensible or informative.

6.9 Consultees agreed with this view.[625] Stephan Smoktunowicz said that, absent a natural language explanation of coded terms, a consumer could not be "confident in knowing what they have signed up to". Catherine Phillips and Katharine Graff commented that the average consumer is unlikely to have knowledge of code.

---

622 Competition and Markets Authority, *Unfair contract terms guidance: Guidance on the unfair terms provisions in the Consumer Rights Act 2015* (2015), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/450440/Unfair_Terms_Main_Guidance.pdf, para 2.45, referring to *Case C-26/13 Árpád Kásler and Hajnalka Káslerné Rábai v OTP Jelzálogbank Zrt*, para 75.

623 Consumer Rights Act 2015, s 70 and sch 3.

624 Competition and Markets Authority, *Unfair contract terms guidance: Guidance on the unfair terms provisions in the Consumer Rights Act 2015* (2015), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/450440/Unfair_Terms_Main_Guidance.pdf, para 40.

625 We asked a general question about the challenges consultees foresaw in applying consumer protection laws to consumer contracts entered into wholly or partly in code. We also asked consultees if there were any additional existing protections, beyond those we discussed, which they thought were or would be particularly important in the smart legal contract context: call for evidence, question 45 at para 6.39.

Therefore, coded terms should be explained to the consumer in natural language before the contract is made. D2 Legal Technology said that traders should provide consumers with "plain, intelligible summaries of smart contract code designs".

6.10 Traders who seek to offer B2C smart legal contracts which contain coded terms would be well advised to provide clear and informative pre-contractual literature to the consumer, explaining those terms and how they operate, in order to comply with the transparency requirement.[626]

Unfair terms and commercial practices

6.11 Under section 62 of the CRA 2015, a term of a consumer contract or consumer notice is not binding on the consumer if it is "unfair".[627] A term or notice is unfair if "contrary to the requirement of good faith, it causes a significant imbalance in the parties' rights and obligations to the detriment of the consumer".[628] All three elements of this test (contrary to good faith, significant imbalance in the parties' rights and obligations, and consumer detriment) are relevant to assessing whether a term or notice is unfair. The test is a unitary one, which is applied as a whole. The CMA has noted that, "a rigid approach to assessing fairness, involving an artificial exercise broken into separate parts, is not appropriate".[629] The CMA has enforcement powers under the CRA 2015 in respect of unfair terms, and a consumer can also challenge the fairness of a term directly in a dispute which arises between them and a trader.

6.12 Under section 64(1) of the CRA 2015, a term of a consumer contract is excluded from being assessed for fairness if the term "specifies the main subject matter of the contract". In addition, a term of a consumer contract is excluded from being assessed for fairness if the assessment concerns the "appropriateness of the price payable under the contract by comparison with the goods, digital content or services supplied under it". However, this exclusion only applies if the term in question is "transparent and prominent".[630] As discussed above, a term is "transparent" if it is expressed in plain and intelligible language, and is legible.[631] A term is "prominent" for the purposes of section 64 "if it is brought to the consumer's attention in such a way that an average consumer would be aware of the term".[632]

6.13 Terms of a B2C smart legal contract which are drafted in code and not accompanied by a natural language explanation may be more susceptible to a finding of unfairness.

---

626 See also T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 32 where the point is made that disclosure could play a role in the context of smart legal contracts offered to consumers. Reference is also made to artificial intelligence systems which can "assist traders and consumers" in meeting disclosure requirements.

627 Consumer Rights Act 2015, s 62(1) and (2).

628 Consumer Rights Act 2015, s 62(4) and (6).

629 Competition and Markets Authority, *Unfair contract terms guidance: Guidance on the unfair terms provisions in the Consumer Rights Act 2015* (2015), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/450440/Unfair_Terms_Main_Guidance.pdf, para 2.10.

630 Consumer Rights Act 2015, s 64(2).

631 Consumer Rights Act 2015, ss 64(3) and 68(2).

632 Consumer Rights Act 2015, s 64(4).

As consultees commented in their responses, such terms may be considered "contrary to the requirement of good faith" on the basis that they are not expressed fully, clearly and legibly, and serve to take advantage of the consumer's lack of familiarity with code. In addition, as coded terms unaccompanied by a natural language explanation are unlikely to be considered transparent or prominent, coded terms that deal with the subject matter of the contract, or the price payable under the contract, may not be excluded from the assessment of fairness under section 64(1) of the CRA 2015. Accordingly, traders would be well advised to provide consumers with a clear, natural language explanation of the coded terms of a B2C smart legal contract, to mitigate the risk of those terms being found to be unfair.

6.14 It is conceivable that a trader may seek to include statements in their pre-contractual literature that a transaction with a consumer is not intended to give rise to legally binding relations. Traders may seek to persuade the consumer that there is no need for a legally binding contract, given that smart contract code performs automatically without human intervention. The code instead provides a guarantee of performance. In Chapter 3 of this paper, we explain that parties are free to rely on statements or clauses disclaiming contractual intention, and that the law of England and Wales can give effect to these.[633] However, in the consumer context, we consider that such statements may be at risk of being unfair consumer notices under section 62(6) of the CRA 2015.[634] This is because the notice would have the effect of depriving the consumer of protections that would ordinarily attach to the transaction, and would create a significant imbalance in the rights and obligations of the parties to the detriment of the consumer.

6.15 We also note that the Consumer Protection from Unfair Trading Regulations 2008 (the "CPRs") prohibit commercial practices which are unfair in relation to the promotion, sale or supply of a "product", which includes goods, a service, digital content, immoveable property and rights or obligations.[635] The CPRs do not just cover the terms of a contract but are instead concerned with relevant practices before, during and after a transaction. The definition of "commercial practice" is broad and includes any act, omission or representation by a trader which is connected with the promotion or supply of a product to consumers.[636] It includes commercial communications such as advertising.

6.16 A commercial practice is unfair if it contravenes the requirements of professional diligence and it materially distorts, or is likely to materially distort, the economic behaviour of the average consumer with regard to the product.[637] A commercial practice is unfair if it is a misleading action, a misleading omission or an aggressive

---

633 We discuss this from para 3.66.

634 A consumer notice is a notice that relates to the rights or obligations as between a trader and a consumer, or purports to exclude or restrict a trader's liability to a consumer. It includes an announcement (whether or not in writing) and any other communication or purported communication: Consumer Rights Act 2015, ss 61(4) and (8).

635 Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277, reg 2(1).

636 Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277, reg 2(1).

637 Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277, reg 3(3).

commercial practice, and it causes or is likely to cause the average consumer to take a transactional decision they would not otherwise have taken.[638]

6.17 The concept of the "average consumer" is also relevant. When determining the effect of a commercial practice on an average consumer, material characteristics shall be taken into account, including being reasonably well informed, reasonably observant and circumspect.[639] Where a commercial practice is directed at a particular group of consumers, the average consumer is read as referring to the average member of that group.[640]

6.18 A consumer who has entered into a contract as a result of an unfair commercial practice may have the right to unwind the contract, obtain a discount, or claim damages.[641] We consider that traders would be well advised to provide consumers with clear, intelligible and accurate explanations of the coded components of a B2C smart legal contract. Failure to do so may amount to a misleading action or omission, and therefore an unfair commercial practice, under the CPRs.

Right to treat the contract as at an end

6.19 A consumer has various statutory rights to treat a consumer contract as at an end in certain circumstances. The CRA 2015 provides that a consumer can treat a consumer contract to supply goods as at an end where, for example, a consumer rejects goods which are not as described,[642] or goods are not delivered within an agreed period.[643] Consumers also have a right to withdraw an offer or cancel certain distance contracts within the timeframes set out in the Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013 (the "CCRs") without giving any reason.[644] The CCRs set out the arrangements for reimbursement by the trader and return of goods by the consumer if a contract is cancelled or an offer is withdrawn.[645]

6.20 As smart legal contracts perform automatically and may therefore not be easy to halt, it may be difficult, practically, for the consumer to exercise these rights. Stephan Smoktunowicz queried how smart legal contracts could enable consumers to exercise their cancellation rights effectively. Professor Christopher Willett and Dr Mateja Durovic (joint response) said that the "robotic and irrevocable nature of performance" of smart legal contracts may hinder the exercise of consumers' termination rights.

---

638 Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277, regs 3(4), 5, 6 and 7 and sch 1.

639 Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277, s 2(1) (definition of "average consumer") and s 2(2).

640 Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277, s 2(4) to (6).

641 Consumer Protection from Unfair Trading Regulations 2008, SI 2008 No 1277, s 27E, 27F, 27H, 27I, and 27J.

642 Consumer Rights Act 2015, s 20(4).

643 Consumer Rights Act 2015, s 28(6).

644 Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013, SI 2013 No 3134, reg 29.

645 Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013, SI 2013 No 3134, regs 33 to 35.

6.21 Smart legal contracts should only be used in the B2C context if they incorporate mechanisms that facilitate these rights. Traders would be well advised to design the B2C smart legal contract so that, where a consumer wishes to exercise their right to treat the contract as at an end, they have the practical means of doing so. This is part of the broader issue about how, as a practical matter, parties with a right to terminate a smart legal contract (whether consumers or not) can bring performance of the code to an end. We discuss this issue in more detail in Chapter 5 of this paper.[646]

Data protection

6.22 B2C smart legal contracts may involve the processing of the consumer's personal data. Personal data is "any information relating to an identified or identifiable natural person".[647] We understand that some consultees have concerns about how traders would comply with their data protection and processing obligations in the context of B2C smart legal contracts. Stephan Smoktunowicz said that traders:

> 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.

6.23 Catherine Phillips commented that the "inability to recall, amend and delete data on an immutable record" may conflict with data protection laws if the data has not been anonymised. Allen & Overy also referred to data protection as a "key" area which must be "fit for purpose" if smart legal contracts are to be used in a "widespread and robust manner".

6.24 Regulatory matters, including data protection law, are beyond the scope of this project. There have been significant developments in this area of the law and there are discussions at international level which might lead to its further evolution.[648] We understand that businesses are adapting quickly to the relevant requirements, and anticipate that they will adopt the necessary measures to comply with data protection laws, should they decide to enter into B2C smart legal contracts.

Are additional protections required?

6.25 Some consultees suggested that there should be a specific legal requirement that traders provide consumers with a natural language explanation of the coded terms of

---

646 We discuss termination of a smart legal contract from para 5.123.

647 Regulation on the protection of natural persons with regard to the processing of personal data and the free movement of such data, repealing Directive 95/46/EC (General Data Protection Regulation) (EU) No 2016/679 Official Journal L 119/1 of 04.05.2016 ("GDPR"), art 4(1). Following the end of the Brexit transition period on 31 December 2020, GDPR was retained under the EU Withdrawal Act 2018, and is commonly referred to as the "UK GDPR". The UK GDPR is supplemented by the Data Protection Act 2018.

648 See Expert Group on Regulatory Obstacles to Financial Innovation, *30 Recommendations on Regulation, Innovation and Finance - Final Report to the European Commission* (December 2019) pp 85 to 86, https://ec.europa.eu/info/sites/default/files/business_economy_euro/banking_and_finance/documents/191113-report-expert-group-regulatory-obstacles-financial-innovation_en.pdf. Recommendation 25 recommends that the European Data Protection Board issues guidance relating to the application of GDPR and other relevant legislation in relation to the use of technology in financial services, including DLT and blockchain related technology.

a B2C smart legal contract.[649] However, in our view, it is likely to be difficult for a trader to comply with the transparency requirement without providing the consumer with natural language information about the coded terms of a smart legal contract. Failure to provide such information may also increase the risk of coded terms being found to be unfair, or of the trader being found to have engaged in an unfair commercial practice.

6.26 In addition, under the CCRs, traders must provide consumers with certain information before they enter into a distance contract (which includes a distance contract concluded by electronic means).[650] Traders must "give or make available" to the consumer the information listed in schedule 2 of the CCRs in a "clear and comprehensible manner, and in a way appropriate to the means of distance communication used".[651] This includes information relating to the main characteristics of the goods, services or digital content, the price and any additional costs, and details of the consumer's cancellation rights.[652] A trader's failure to provide the information required by the CCRs may amount to a breach of contract,[653] or a "misleading omission" or "misleading action" under the CPRs.[654]

6.27 Accordingly, we do not consider that it is necessary, at present, to introduce a separate legal requirement that traders provide a natural language explanation of coded terms to consumers. In our view, the existing law already effectively places traders under such an obligation. However, we do consider that the adequacy of existing consumer protection laws should be kept under review by the CMA and Government as B2C smart legal contracts become increasingly sophisticated and prevalent. The Law Commission would be well-placed to assist with any future work required in this area.

USE CASES FOR B2C SMART LEGAL CONTRACTS

6.28 In the call for evidence, we asked consultees if they were aware of any B2C smart legal contracts currently in use or in development.[655] In response to the call for evidence, consultees referred to a number of use cases for B2C smart legal contracts, which we describe in more detail below. We have prepared these descriptions based

---

649 We asked consultees what, if any, additional protections were required for consumers entering into smart legal contracts. We asked if, in particular, consultees considered that there was a case for an explicit legal requirement that the terms of a consumer contract which are fully or partly in code must be explained in natural language before the conclusion of the contract: call for evidence, question 46 at para 6.40.

650 The Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013, SI 2013 No 3134, regs 13 and 14.

651 Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013, SI 2013 No 3134, reg 13(1)(a).

652 Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013, SI 2013 No 3134, regs 13 and 14, schs 2 and 3.

653 Under the Consumer Contracts (Information, Cancellation and Additional Charges) Regulations 2013, SI 2013 No 3134, reg 18, distance contracts are treated as including a term that the trader has complied with the provisions of regulations 9 to 14, and 16. See also H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 40-107.

654 H Beale (ed), *Chitty on Contracts* (34th ed 2021) paras 40-112 to 40-114.

655 Call for evidence, question 43 at para 6.5.

on the responses we received from consultees and publicly available information. We are not directly familiar with the products.

Insurance

6.29 The Digital Law Association and Cuneyt Eti referred to Etherisc, a German based organisation which is developing a range of blockchain-based insurance-type products.[656] We understand that the products developed by Etherisc take the form of natural language agreements which are performed automatically by smart contracts deployed on the Ethereum and xDai networks. The premise is that a customer purchases protection against a particular event, such as a flight delay or a hurricane, by paying premiums to Etherisc via a user interface, either in fiat currency, cryptocurrency or tokens. The occurrence of the event triggers the execution of the blockchain-based smart contract, resulting in an automatic payment to the customer. At the time of publication of this paper, Etherisc claims to have over 20 products either at proof of concept stage or on offer to customers.

6.30 According to Etherisc, the contract between it and the customer is not intended to be an "insurance contract" for German law purposes. The contract does not contain a promise to pay the customer on the occurrence of the specified event, and in fact expressly excludes any such promise.[657] The contract is instead intended as a contract for the provision of services, under which Etherisc promises to "run a set of smart contracts" which are programmed to transfer payment to the customer on the occurrence of the event.[658] A legal promise to pay the customer is considered by Etherisc to be unnecessary given that the computer program (if run correctly) is guaranteed to execute on the occurrence of the event.[659]

Sale of digital content

6.31 The Digital Law Association referred to YouPic, a blockchain-based platform that "connects content creators with content consumers in an open, decentralised way".[660] Through the YouPic user interface, a photographer can upload their images to a private blockchain, along with a smart contract which sets the price and terms for the use of each image. Customers can then purchase the photographs using the YouPic platform, with payment automatically being made to the photographer by the smart contract. The use of smart contracts is said to benefit photographers by removing the need for intermediaries, such as brokers, who would traditionally take a commission from photographers.

6.32 Platforms such as YouPic could encompass B2C smart legal contracts, depending on the purposes for which the respective parties are acting. Under the law of England and Wales, a "trader" is defined as "a person acting for purposes relating to that

---

656 The parametric insurance use cases discussed at paras 2.93 to 2.95 of this paper may also include B2C smart legal contracts.

657 Etherisc, "FAQ", https://etherisc.com/faq.

658 Etherisc, "A new legal model for blockchain based insurance" (26 August 2020), https://blog.etherisc.com/a-new-legal-model-for-blockchain-based-insurance-27c589a9f329.

659 Etherisc, "FAQ", https://etherisc.com/faq.

660 YouPic, "Introducing YouPic blockchain", https://youpic.com/blockchain.

person's trade, business, craft or profession".[661] Accordingly, a professional photographer who licenses their images on YouPic could be considered a "trader" for the purposes of the law of England and Wales. An individual who purchases the right to use the image could be considered a "consumer" if they are "acting for purposes that are wholly or mainly outside that individual's trade, business, craft or profession".[662] As Florian Idelberger said in his response, the increase in trading between individuals on DLT systems and online marketplaces may give rise to the potentially difficult question of when an individual will be classified as a "trader" and "consumer" for legal purposes.

Ride-sharing

6.33 The Digital Law Association referred to Drife, which is a decentralised ride-sharing application that runs on the EOS.IO blockchain. We understand that a customer can open the app, specify their destination, and choose an available driver. When the customer chooses a driver, a smart contract is generated that connects a particular driver and the rider. The funds are held in escrow until the ride is completed, following which the smart contract automatically transfers payment to the driver.[663]

6.34 Drivers are paid directly by the customer and pay an annual fee to use the app. To the extent that drivers and riders on the Drife app can be respectively classified as "traders" and "consumers", their use of the Drife app could be said to be a B2C smart legal contract.

---

661 Consumer Rights Act 2015, s 2(2).

662 Consumer Rights Act 2015, s 2(3).

663 See Accesswire, "Drife.io Set to Disrupt the "Uber" Market - Decentralized Ride-Hailing is Finally Here" (17 May 2021), https://www.accesswire.com/647880/Drifeio-Set-to-Disrupt-the-Uber-Market--Decentralized-Ride-Hailing-is-Finally-Here.

Chapter 7: Jurisdiction and smart legal contracts

INTRODUCTION

7.1 In this chapter, we consider the factors that may determine whether the courts of England and Wales will have jurisdiction to hear a cross-border dispute in relation to a smart legal contract, in the absence of a jurisdiction or choice of court agreement between the parties to the smart legal contract.[664] We begin by outlining the meaning of jurisdiction, and explaining the significance of a number of recent developments in the domestic private international law landscape. We then approach the question of jurisdiction thematically, by reference to the following themes.

(1) Contracting parties and the circumstances of contract formation.

(2) Applicable law.

(3) Performance, breach, acts, and enrichment.

(4) Consumer contracts, employment contracts, and insurance contracts.

(5) Comparative appropriateness.

(6) The most problematic jurisdictional rules and issues, including digital location.

7.2 Throughout the discussion, we reflect on whether the current rules of private international law are appropriate for smart legal contracts, and identify issues that may require further consideration.

7.3 We have agreed with Government that we will undertake a project looking at the rules relating to conflict of laws as they apply to emerging technology, including smart legal contracts and digital assets, and considering whether reform is required. We expect that this future project will consider some of the problems identified in this chapter. We hope to be in a position to begin this work in mid-2022.[665]

THE APPLICABLE PRIVATE INTERNATIONAL LAW RULES

7.4 Private international law, also known as conflict of laws, is the branch of law which applies to disputes that engage foreign legal systems. Broadly speaking, this may be the case because:

---

664 Jurisdiction agreements are also commonly referred to as jurisdiction clauses, choice of court clauses and forum selection clauses. An analysis of such clauses in the smart legal contract context is beyond the scope of the project's terms of reference.

665 In our recent consultation on which areas of law should make up our next programme of law reform, we asked whether such a project would be welcomed: Generating ideas for the Law Commission's 14th programme of law reform (March 2021), https://www.lawcom.gov.uk/14th-programme/#introduction.

a contract was made or to be performed in a foreign country, or because a tort was committed there, or because property was situated there, or because the parties are not English [or Welsh].[666]

7.5 As we discuss in Chapter 2, smart legal contracts can be used to facilitate cross-border financial activity, supply chain management, and peer-to-peer transacting. In addition, smart legal contracts are commonly deployed using DLT. [667] As such, we think that smart legal contracts are more likely to give rise to a variety of connections to various legal systems, than they are to be completely connected to just one jurisdiction.[668] When a smart legal contract dispute with a foreign element comes before a court in England and Wales, the first question that will arise is whether the court has jurisdiction to adjudicate the dispute.

7.6 When the call for evidence was published in December 2020, there was significant uncertainty about the private international law rules that would apply in the UK after the Brexit transition period ended on 31 December 2020.[669] We observed in the call for evidence that, although the UK had applied to accede to the Lugano Convention,[670] that application remained to be negotiated and approved by the Convention's signatories. It was therefore an "open question", at the time of writing the call for evidence, as to what the legal position would be after 31 December 2020, when the transition period ended. We also explained that the existing European regimes would (where applicable) continue to take precedence over the common law rules for the duration of the transition period. These included the rules contained in the recast Brussels I Regulation,[671] and the Lugano Convention.

7.7 Since publication of the call for evidence, there have been a number of important developments. First, the transition period has ended. This means that jurisdiction in cross-border disputes is now determined by the application of the common law regime, as supported by a number of ancillary pieces of legislation.[672] Unlike the

---

666 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 1-001.

667 We discuss use cases for smart legal contracts from para 2.86.

668 T Schrepel, European Commission, *Smart Contracts and the Digital Single Market Through the Lens of a "Law + Technology" Approach* (September 2021) p 39 for a similar view, and where the point is made that smart (legal) contracts operated on blockchains involving nodes located in various jurisdictions could be considered cross-border.

669 Call for evidence, paras 7.7 to 7.8.

670 Convention on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters (EU) Official Journal L 339/3 of 21.12.2007 p 3 ("Lugano Convention").

671 Regulation on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters (EU) No 1215/2012 Official Journal 2012 L 351 of 12.12.2012 p 1 ("recast Brussels I Regulation").

672 Principally, the procedural rules contained in Part 6 of the Civil Procedure Rules 1998, as well as certain provisions of the Civil Jurisdiction and Judgments Act 1982 as amended by the Civil Jurisdiction and Judgments (Amendment) (EU Exit) Regulations 2019, SI 2019 No 479, and by the Jurisdiction, Judgments and Applicable Law (Amendment) (EU Exit) Regulations 2020, SI 2020 No 1574. See, generally: Ministry of Justice, *Cross-border civil and commercial legal cases: guidance for legal professionals* (31 December 2020), https://www.gov.uk/government/publications/cross-border-civil-and-commercial-legal-cases-guidance-for-legal-professionals/cross-border-civil-and-commercial-legal-cases-guidance-for-legal-professionals.

European rules concerning applicable law, which form part of domestic law,[673] and the 2005 Hague Convention on Choice of Court Agreements, which the UK has acceded to and ratified in its own right as of 1 January 2021,[674] the European rules governing jurisdiction have predominantly fallen away.[675]

7.8 Second, the UK's application to accede to the Lugano Convention, which required the consent of all the Convention's signatories (including the EU) has been rejected. On 1 July 2021, the Swiss Federal Council formally announced the EU's withdrawal of consent to the Convention's signatories.[676] According to the EU, accession to the Convention is not open to a "third country"; that is, a country that is neither a member of the EU nor a member of the European Free Trade Association, such as the UK.[677] Whilst we understand that there is nothing to prevent the UK from submitting a second application to accede to the Lugano Convention, at present the Convention does not apply.

7.9 Accordingly, in this chapter we primarily focus on the common law rules for determining jurisdiction in relation to contractual disputes involving smart legal contracts. Broadly speaking, the court asks itself two questions in order to establish that it has jurisdiction to adjudicate a contractual dispute.

(1) Is there a jurisdictional basis for the court to adjudicate upon the contractual dispute?

---

673 The Rome I and Rome II regulations were retained under the EU Withdrawal Act 2018, and have been amended to function as domestic legislation by the Law Applicable to Contractual and Non-Contractual Obligations (Amendments etc.) (EU Exit) Regulations, SI 2019 No 834. The Rome Convention (which determines the law applicable to contracts entered into between 1 April 1991 and 16 December 2009) is also preserved in domestic law by the Contracts (Applicable Law) Act 1990, as amended by the Jurisdiction, Judgments and Applicable Law (Amendment) (EU Exit) Regulations 2020.

674 See also the Private International Law (Implementation of Agreements) Act 2020. There is some uncertainty about the date on which the 2005 Hague Convention will be interpreted as having come into force for the UK. The Ministry of Justice, in its *Cross-border civil and commercial legal cases: guidance for legal professionals* (31 December 2020), has indicated that the convention "applies to the UK (without interruption) from its original entry into force date of 1 October 2015". However, the EU has indicated that it takes the view that the 2005 Hague Convention will only apply between the EU and the UK to jurisdiction agreements entered into after the UK acceded to the convention in its own right: see European Commission, *Withdrawal of the United Kingdom and EU rules in the field of civil justice and private international law* (27 August 2020), section 3.3. On this view, it would not apply to exclusive jurisdiction agreements entered into between 1 October 2015 (the EU's date of accession) and 1 January 2021 (the UK's date of accession in its own right).

675 The European regimes continue to govern proceedings that were commenced before the end of the transition period on 31 December 2020, and related proceedings (within the meaning of articles 29 and 30 of the recast Brussels I Regulation). The relevant date is the date on which proceedings were commenced, not the date on which any cause of action arose.

676 Swiss Federal Council, *Notification to the Parties of the Convention on Jurisdiction and the Recognition and Enforcement of Judgments in Civil and Commercial Matters, concluded at Lugano on 30 October 2007* (1 July 2021), https://www.eda.admin.ch/dam/eda/fr/documents/aussenpolitik/voelkerrecht/autres-conventions/Lugano2/20210701-LUG_en.pdf.

677 European Commission, *Assessment on the application of the United Kingdom of Great Britain and Northern Ireland to accede to the 2007 Lugano Convention* (4 May 2021) p 4, https://ec.europa.eu/info/sites/default/files/1_en_act_en.pdf.

(2) If so, is England and Wales the proper place for the claim to be brought?

7.10 As to the first question, and in the absence of a jurisdiction agreement between the parties, a court in England and Wales may have jurisdiction to adjudicate upon a contractual dispute if:

(1) the defendant was served with the claim form whilst physically present in England and Wales;[678]

(2) the court grants permission to serve the claim form on a defendant who is not physically present in England and Wales, because there is a good arguable case[679] that the claim falls within one or more of the jurisdictional gateways set out in paragraph 3.1 of Practice Direction 6B in the Civil Procedure Rules 1998,[680] and there is a serious issue to be tried;[681] or

(3) the defendant submits to the jurisdiction of the court.[682]

7.11 As to the second question, the exercise of the court's discretion to refuse to hear a dispute is referred to as the principle of *forum (non) conveniens* (literally "(in)appropriate forum"). If a basis for jurisdiction is made out, the court will have jurisdiction to hear the case only if it is satisfied that England and Wales is clearly the appropriate forum to adjudicate the dispute.[683] The court will not have jurisdiction to adjudicate the dispute (even if a jurisdictional basis is made out) if the matter could be more appropriately resolved by the courts of another legal system.[684] This

---

678 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 11R-101.

679 The "good arguable case" test was authoritatively explained by Lord Sumption in *Brownlie v Four Seasons Holdings International* [2017] UKSC 80, [2018] 1 WLR 192 at [7], and his Lordship's formulation was subsequently approved by a unanimous Supreme Court in *Goldman Sachs International v Novo Banco SA* [2018] UKSC 34, [2018] 1 WLR 3683 at [9].

680 These jurisdictional gateways include: that the contract was made within England and Wales, or made by or through an agent trading or residing in England and Wales, or governed by English law (PD6B para 3.1(6)); that a breach of contract was committed within England and Wales (PD6B para 3.1(7)); that the claim is for a declaration that no contract exists where, if found to exist, the contract would fall within para 3.1(6) (PD6B para 3.1(8)); that the claim is for restitution and the defendant's liability arises out of acts committed within England and Wales, or their enrichment is obtained within England and Wales (PD6B para 3.1(16)); that the defendant is a necessary and proper party to a separate claim that has been properly commenced in England and Wales (PD6B para 3.1(3)); and that the court already has jurisdiction to hear a different claim against the defendant, for example a claim in tort, and the contractual claim arises out of the same or closely connected facts (PD6B para 3.1(4A)).

681 *Seaconsar Far East Ltd v Bank Markazi Jomhouri Islami Iran* [1994] 1 AC 438, 453 to 454; *Altimo Holdings and Investment Limited v Kyrgyz Mobil Tel Limited* [2011] UKPC 7, [2012] 1 WLR 1804 at [71]; *FS Cairo (Nile Plaza) v Lady Brownlie* [2021] UKSC 45 at [28].

682 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 11R-124.

683 *VTB Capital plc v Nutritek International Corp* [2013] UKSC 5, [2013] 2 AC 337. See also CPR r 6.37(3).

684 *The Spiliada* [1987] AC 460, 474.

comparative appropriateness enquiry is practical and fact-sensitive.[685] The "fundamental principle" is that the court has:

> to identify the forum in which the case can be suitably tried for the interests of all the parties and for the ends of justice.[686]

7.12 Although our focus is on the common law rules, which we explore thematically, we nevertheless refer at various points to related rules contained in the previously applicable European regimes. We do so for three reasons. First, to contextualise our discussion of the responses that we received to the call for evidence, some of which included informative discussions of the European regimes' rules. Second, to engage in comparative analysis, as a point of contrast to the (now different) domestic position. Third, to aid in our exploration of some of the more novel jurisdictional issues raised by smart legal contracts. As legal practitioners and marketplace actors are likely to be familiar with these European rules, they remain a useful means of evaluating the appropriateness of certain jurisdictional rules to the practice of smart legal contracting.

CONTRACTING PARTIES AND THE CIRCUMSTANCES OF CONTRACT FORMATION

7.13 A court's jurisdiction to adjudicate upon a contractual dispute involving a smart legal contract may be based on certain facts about the contracting parties, or about the circumstances in which the smart legal contract was formed. In particular, jurisdiction can depend upon a contracting party's presence or place of domicile, or on the location where, and the means by which, the smart legal contract was formed. A prerequisite to considering these matters, however, is being able to identify a defendant.

Identity, presence, and domicile

7.14 As we discuss in Chapter 3, the pseudonymous nature of some technological systems, such as DLT systems, may make it comparatively more common for a party to enter into a smart legal contract without knowing the real identity of their counterparty.[687] As such, there are likely to be situations where the parties to a smart legal contract do not know, and may not be able to discover, each other's identities. This poses problems for questions of presence and domicile. As Professor Andrew Dickinson has observed in the related context of cryptocurrency systems:

> The pseudonymity of users … may make it difficult to locate not only the rights and acts in question but also the actors.[688]

7.15 In England and Wales, a court will have jurisdiction to hear a contractual claim if the defendant is served with the claim form at a time when they are physically present in

---

685 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) paras 12-030 to 12-035. We discuss the comparative appropriateness inquiry in more detail from para 7.126.

686 *The Spiliada* [1987] AC 460, 474 and 480, by Lord Goff. See also *FS Cairo (Nile Plaza) v Lady Brownlie* [2021] UKSC 45 at [78] to [79], by Lord Lloyd-Jones.

687 We discuss this from para 3.19.

688 A Dickinson, "Cryptocurrencies and the Conflict of Laws" in D Fox and S Green (eds), *Cryptocurrencies in Public and Private Law* (2019) para 5.08.

England or Wales.[689] However, where parties have contracted without knowing, and without being able to discover (at least at the point of commencing a claim), each other's identities, this is plainly not a viable basis for establishing jurisdiction. In fact, it poses a significant obstacle to a party's ability to bring a claim at all.

7.16 In the call for evidence,[690] we said that the defendant's domicile was usually determinative of whether jurisdiction would be determined by the common law rules or the European rules.[691] However, if the defendant's identity was unknown to the claimant, it would be difficult to ascertain where the defendant was domiciled.[692] In the absence of this knowledge, a claimant would have to rely on the default common law rules.[693] We suggested that this risked disadvantaging a claimant in the following scenario: the court could decide that it does not have jurisdiction to hear the dispute on the basis that England and Wales is not the appropriate forum in circumstances where, had the defendant's domicile been known, the court would have had jurisdiction under the non-discretionary rules of the applicable European regime.

7.17 Ultimately, however, this particular point has become somewhat academic with the falling away of the European regimes.[694] Nevertheless, we think that the general observation – that additional problems related to counterparty identity are likely to arise in the context of smart legal contracts – holds true.

Place of contract formation

7.18 Jurisdiction can also depend upon the circumstances in which a smart legal contract is formed. Under the common law rules, a court's jurisdiction to hear a contractual dispute can be based on the fact that the smart legal contract was formed within

---

689 A particularly illustrative example is *Maharanee of Baroda v Wildenstein* [1972] 2 QB 283, where a French art dealer was served with proceedings during a brief visit to England to watch horseracing at the Ascot Racecourse.

690 Call for evidence, para 7.13.

691 Exceptions to this principle included where the rules of exclusive jurisdiction were engaged, or where the parties had agreed that the court(s) of a Member State were to have jurisdiction. An example of a rule of exclusive jurisdiction is article 24(1) of the recast Brussels I Regulation. For disputes that concern title to (or tenancies in) immovable property, this rule allocates jurisdiction exclusively to the courts of the Member State in which the property is situated, irrespective of the defendant's domicile. The rationale underlying rules of exclusive jurisdiction is that certain courts are uniquely well placed to hear disputes over certain subject matter: P Torremans (ed), *Cheshire, North & Fawcett, Private International Law* (15th ed 2017) p 217.

692 We noted that in Case C-327/10 *Hypoteční banka as v Lindner* [2011] ECR I-11543, the CJEU indicated that a defendant whose domicile was presently unknown could be treated as domiciled in their last known place of domicile. We suggested, however, that this was inapplicable to the situation where the defendant's domicile had never been known.

693 This was how the issue of jurisdiction was approached by Bryan J in *AA v Persons Unknown* [2019] EWHC 3556 (Comm), [2020] 4 WLR 35 at [67] to [71]. This was a claim brought by a Canadian insurance company against four defendants, two of whom were not known to the claimant. The Canadian company had been hacked, and the hackers demanded payment in bitcoin to reverse the effects of the malware that had been installed on the company's computers.

694 However, on recent authority (which we discuss at 7.140), the concept of domicile may continue to be relevant to the common law rules for determining the location of digital assets, which are commonly the subject matter of smart legal contracts.

England or Wales.[695] The general rule is that a contract is formed at the moment when, and in the place where, acceptance of an offer is communicated to the offeror.[696] So, a contract is made in England and Wales if communication of the offeree's acceptance is received by the offeror in England and Wales.[697]

7.19 Normally, communication of the offeree's acceptance must actually be received by the offeror. However, in some circumstances, the law will deem acceptance to have taken effect (and so a contract to have been formed) at a point in time when the acceptance has not in fact been communicated. The classic example of this is that a posted acceptance takes effect when and where it is posted, rather than when and where it is received.[698] Additionally, the law will sometimes deem an offeror to have expressly or implicitly waived the requirement that an acceptance must actually be communicated to them. For example, where acceptance of an offer fails to be communicated through the fault of the offeror, or in the case of a unilateral contract, where a party makes a promise to do something if someone else performs a specified act. In the latter case, performing the act is sufficient for acceptance.[699]

7.20 The analysis of contract formation in relation to smart legal contracts will depend upon the form that the smart legal contract takes. For smart legal contracts which involve a natural language contract with automated performance, the place of formation will be determined by reference to the parties' natural language negotiations and the ordinary rules of contract formation. It has been accepted, at least for jurisdictional purposes, that a contract can be made in two (or more) places at once.[700]

7.21 A solely code smart legal contract is likely to be the most challenging context in which to apply the current rules and principles of contract formation. In the call for evidence, we referred to two examples of solely code smart legal contract formation.[701] In the first, Alice deploys a piece of code on a distributed ledger which Bob subsequently interacts with in a specified way. This is an example of unilateral smart legal contract formation. In the second, Alice deploys a computer program on a distributed ledger which makes an offer that is subsequently accepted by a computer program that has

---

695 Civil Procedure Rules 1998, Practice Direction 6B, para 3.1(6)(a).

696 As long as the agreement is sufficiently complete and certain, compliant with any required formalities, made with consideration, and intended to create legal relations between the parties: see generally H Beale (ed), *Chitty on Contracts* (34th ed 2021) ch 4 (The Agreement). We discuss the requirements for the formation of a legally binding contract, and how they may be satisfied in relation to smart legal contracts, in Chapter 3.

697 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 11-181.

698 *Adams v Lindsell* (1818) 1 ER 250. On a contemporary basis, the rule relating to posted acceptance applies only where the postal service is a reasonable or agreed medium: H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 4-066.

699 H Beale (ed), Chitty on Contracts (34th ed 2021) para 4-059; *Carlill v Carbolic Smoke Ball Co* [1893] 1 QB 356; *Harvela Investments Ltd v Royal Trust of Canada (CI) Ltd* [1986] AC 207, 224, by Lord Diplock; *Soulsbury v Soulsbury* [2007] EWCA Civ 969, [2008] Fam Law 13 at [50] by Longmore LJ; *Air Transworld Ltd v Bombardier Inc* [2012] EWHC 243 (Comm), [2012] 1 Lloyd's Rep 349 at [79] by Cooke J.

700 H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 4-064, fn 275; *Conductive Inkjet Technology Ltd v Uni-Pixel Displays Inc* [2013] EWHC 2968 (Ch), [2014] 1 All ER (Comm) 654 at [72] to [73]; *Apple Corps Ltd v Apple Computer Inc* [2004] EWHC 768 (Ch), [2004] 2 CLC 720 at [36] to [42].

701 Call for evidence, paras 7.22 and 7.23.

been deployed by Bob. This is an example of a smart legal contract formed by the autonomous interaction of computer programs.

7.22 We and consultees have identified a range of potential difficulties and uncertainties that could arise when seeking to identify the place of formation of different types of smart legal contracts.[702]

Unilateral solely code smart legal contracts

7.23 For unilateral solely code smart legal contracts, there is a degree of uncertainty about the place of contract formation. The smart legal contract could be said to be formed at the place where Bob performs the act specified in the deployed code, albeit this location might be something over which Alice has little control. Alternatively, it could be said to be formed at the place where Alice has the acceptance communicated to her (if that occurs), despite the fact that actual communication of acceptance is not typically required for the formation of unilateral contracts. Finally, it could be formed at some other place(s).

Solely code smart legal contracts formed by computer programs

7.24 For solely code smart legal contracts that are formed by the autonomous interaction of computer programs, there is an even greater degree of uncertainty, and a greater variety of possibilities. For example, the contract could be said to be formed either at the place where Bob is located at the moment when his computer program accepts the offer, or at the place where Bob is located at the moment when his acceptance is communicated to Alice (if that occurs). Or, the smart legal contract could be said to be formed at the place where Alice is located at the moment that acceptance takes place, or at the place where Alice is located at the moment when that acceptance is communicated. As a further alternative, if the computer programs are running on distributed ledgers, it may be that the place of contract formation is determined by the location of some quantity of participating nodes.

Hybrid smart legal contracts

7.25 For hybrid smart legal contracts, which are comprised of terms defined in natural language and terms defined in code, the place of contract formation will be highly fact-sensitive. If a hybrid smart legal contract is found to have been formed when a document containing the natural language terms is signed by the parties, the place of formation poses no novel difficulties. Alternatively, if a hybrid contract is found to have been formed at the moment when coded terms are deployed on a distributed ledger, determining the place of formation will necessitate overcoming the sorts of challenges identified above in relation to solely code smart legal contracts. All will depend on the facts of the particular case.

Additional layers of complexity

7.26 The examples discussed above identify difficulties in ascertaining the place of contract formation in a simplified, two-party context. However, we think that the task of

---

[702] We asked consultees whether they were aware of, or foresaw, any difficulties in identifying the place of formation of a smart legal contract: call for evidence, question 47 at para 7.27. The majority of consultees agreed that there could be difficulties in identifying the place of formation of a solely code smart legal contract.

identifying a smart legal contract's place of formation is likely to be even more complicated when considering multi-party arrangements, as well as the decentralised nature of DLT more generally. We think this for three reasons.

7.27 First, any complexity that exists in relation to a bilateral smart legal contract is exacerbated in the context of multilateral contracts. Cuneyt Eli gave the example of the analysis being complicated by intermediation – for example, parties contracting in relation to digital assets that are held by third parties in custodian-type arrangements. More broadly, Peter Howes noted that "many smart contracts will involve multiple contracting parties (rather than just two) which further adds to the complexity".[703] Participants may be located across a number of different jurisdictions, and it may be extremely difficult to identify the location of any given participant at a particular time.

7.28 Second, the coded elements of a smart legal contract deployed on a distributed ledger system will likely be running on all of the system's full nodes, which may be dispersed across multiple geographical locations. As Peter Howes put it, "the smart contract is deployed across many, not one, node". Not only are full nodes likely to be located across a number of different countries, but it may also be extremely difficult to identify the location of any given node at a particular time. Indeed, nodes may not have a stable location. The LawTech Sounding Board expressed the point as follows:

> 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?

7.29 Third, there may be several disjuncts between the location of a full node(s) running any coded element of a smart legal contract, the location of the user who has triggered its deployment, and the location of any user that interacts with it. Peter Howes explained that:

> 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).

7.30 The more elements involved in the formation of a smart legal contract and, as a consequence, the more legal systems potentially engaged, the more challenging (and perhaps artificial) it will be to identify a particular place of formation.[704]

---

703 This point was also made by the Law Society of England and Wales, Linklaters, Allen & Overy, and Cuneyt Eli.

704 The process of determining a contract's place of formation by reference to the point in time and location of an acceptance, for the purposes of the PD6B para 3.1(6)(a) gateway, was described as "artificial" and as giving rise "to serious practical difficulties" in obiter comments by Lord Sumption in *Brownlie v Four Seasons Holdings International* [2017] UKSC 80, [2018] 1 WLR 192 at [16]. The operation of the PD6B para 3.1(6)(a) gateway was also criticised by Lord Leggatt (obiter) in *FS Cairo (Nile Plaza) v Lady Brownlie* [2021] UKSC 45 at [211] to [213], who suggested that "the bare fact that one of the parties was in England when the contract was made is in modern times a tenuous connection with the jurisdiction".

Possible solutions

7.31 As well as discussing the difficulties involved in identifying the place of formation of a solely code smart legal contract, a number of consultees proposed possible solutions. The Chancery Bar Association and Commercial Bar Association (joint response) and Allen & Overy both endorsed the traditional rule for identifying a contract's place of formation. The Chancery Bar Association and Commercial Bar Association said that 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". They suggested that a unilateral solely code smart legal contract should be deemed to have been formed in the place where Alice was located when the acceptance was communicated to her. Additionally, they suggested that a smart legal contract formed by the autonomous interaction of two computer programs should be deemed to have been formed at the place where Alice was located when acceptance takes place.[705]

7.32 Allen & Overy also supported the general approach of looking to the location of the party that makes the offer. They said that "focusing on the location of the offeror" would render it unnecessary "to consider other factors such as whether certain parts of the contract were formed via nodes … potentially in different places". However, they also recognised that focusing on the offeror's location when acceptance is communicated to them presupposes that acceptance either is (or should be) communicated. When the communication of acceptance is not required, and does not occur, a rule of formation that looks to the offeror's location may lead to "uncertainties".

7.33 An alternative solution was proposed by DLA Piper UK. They suggested that a new legal rule could be developed whereby a smart legal contract would be deemed to have been formed in the place of the offeror's domicile. They said that such a principle would usually produce the same result as the traditional rule, namely that the contract is formed at the place where an acceptance is communicated to the offeror. However, they said that it could lead to a different result in certain circumstances, such as where an acceptance is communicated to the offeror whilst they are abroad on holiday.

7.34 More far-reaching was Allen & Overy's suggestion that the difficulties involved in identifying a smart legal contract's place of formation could justify reform of the jurisdictional gateway in para 3.1(6)(a) of Practice Direction 6B.[706] This gateway provides that a claimant may be granted permission to serve a claim form on a defendant outside of England and Wales, if the claim concerns a contract that was made within England and Wales. Allen & Overy commented that it may well be time to reconsider the appropriateness of a contract's place of formation as a basis of jurisdiction. However, this comment was caveated by the observation that, in their experience, "parties do not commonly rely on [this gateway] to establish the jurisdiction of the English courts", and that "this anecdotal view" was supported by the "relative absence of case law in this area". Accordingly, they said that, although an option, "reform of this rule should not be at the top of the priority list".

---

[705] We note that this suggestion does not necessarily seem to require that the acceptance is communicated to Alice.

[706] Civil Procedure Rules 1998, Practice Direction 6B, para 3.1(6)(a).

7.35 Of the various solutions proposed, a common thread was to focus on the location of the offeror at the time when the offeree's acceptance was communicated to them. However, it is difficult to see how this approach would apply to smart legal contracts where acceptance does not need to be communicated to the offeror, and therefore does not occur. As we said above, formation of a solely code smart legal contract through deployment and interaction with the code is an example of a unilateral contract, where the communication of an acceptance is not required for the formation of a valid contract. Similarly, where a solely code smart legal contract is formed through the autonomous interaction of the parties' computer programs, a legally binding agreement comes into effect notwithstanding the absence of any communication of the offeree's acceptance to the offeror. The appropriate analysis in both cases may be that the parties have implicitly waived any requirement that an acceptance be communicated.

7.36 We recognise that one means of providing greater certainty for parties making use of smart legal contracts would be to develop a bespoke principle that identified a smart legal contract's place of formation. This is something we may consider in our future work on conflict of laws and emerging technology.

Making use of jurisdiction clauses to mitigate legal risk

7.37 Although jurisdiction clauses are beyond the scope of this project, a number of consultees emphasised that best practice in this space would be for parties to include jurisdiction clauses in their smart legal contracts. For example, Charles Kerrigan and Professor David Lowe (joint response) said that the difficulties identified in the call for evidence in relation to identifying a place of formation emphasised the importance of building jurisdiction clauses into smart legal contracts. The same point was made by Eversheds Sutherland and Dr Robert Herian. The latter raised the possibility of numerically embedding a jurisdiction clause into a smart legal contract through the inclusion of a co-ordinate pointing towards a particular jurisdiction; a "GPS-style pin or marker". Stephen Smoktunowicz said that electing a place of formation would be a solution, although he said this would 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".

7.38 Although we have not considered jurisdiction clauses in any detail, we consider that parties would be well advised to include jurisdiction (and, as we discuss below, choice of law) clauses in their smart legal contracts, in the same way that it is good practice to do so for traditional contracts. Such clauses are perhaps particularly important in the smart legal contract context, given the difficulties involved in applying the current principles of conflict of laws to smart legal contracts in some cases.

Jurisdiction based on location of an agent

7.39 At common law, an agent can (by virtue of their relationship with another person, the principal) change the legal relations of the principal. For example, an agent may have power to bind his principal by contract.[707]

[707] H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 21-001.

7.40 Jurisdiction can be based on the location of an agent involved in the contractual process. Under the common law rules, a court will have jurisdiction if a contract was made by or through an agent trading or residing in England or Wales.[708]

7.41 There are two smart legal contract scenarios that, at least at first glance, raise potentially novel jurisdictional issues in relation to agency.[709] Below, we conclude that a third-party coder could be an agent of one or both of the parties, depending on the precise relationship in a particular case. In contrast, and following the decision of the Singapore Court of Appeal in *Quoine Pte Ltd v B2C2 Ltd*,[710] we consider that a computer program (or a computer itself) would not be regarded as an agent.

Computer coder as agent

7.42 A computer coder engaged to produce coded terms for a smart legal contract could be regarded as an agent of one or both of the parties. Grounding jurisdiction in the fact of a third-party coder being an agent of one or both of the parties would not be a novel extension of the existing rules. DLA Piper UK said that they could "see no reason why a natural person could not act as an agent in relation to a smart contract". As Allen & Overy said, it would be the application of the jurisdictional gateway in para 3.1(6)(b) of Practice Direction 6B to a new factual scenario.

7.43 Stephen Smoktunowicz suggested that it would be more likely for a coder to be the agent for one party, rather than for both. Ultimately, determining agency in this context will be a fact sensitive assessment based on the relationship between the parties to the smart legal contract, and any coder they employ in development of their smart legal contract.

Computer programs are not agents

7.44 We have considered whether a computer program, which has autonomously reached an agreement that binds the relevant party to the smart legal contract, could be regarded as that party's agent. We have concluded that it could not.

7.45 DLA Piper suggested that a computer program could be classified as a party's "quasi-agent" because it "could be appointed expressly, impliedly or through ratification of actions by the principal". Additionally, "it would be possible to determine whether or not the programme has acted in line with its duties as an agent". However, they noted that the concept of a computer program as an agent "falls down … in relation to remedies available to the principal against the programme for breach of its duties", and concluded that "a computer programme is unlikely to be treated as an agent".

---

708 Civil Procedure Rules 1998, Practice Direction 6B, para 3.1(6)(b).

709 We asked consultees about the circumstances in which a court's jurisdiction to hear a smart legal contract dispute could be based on the actions and locations of an agent of one or both of the parties: call for evidence, question 48 at para 7.30.

710 [2020] SGCA(I) 02.

7.46 As Kenneth Parker QC (as he then was) said in *Software Solutions*,[711] a computer program cannot be an "agent" because only a person with a "mind" can be an agent at law.[712]

APPLICABLE LAW

7.47 The law applicable to the parties' contractual obligations is a distinct issue from whether or not a court has jurisdiction to hear a claim in relation to those obligations. However, there are a number of ways in which the applicable law can be relevant (and sometimes determinative) of the question of jurisdiction. For example, the law applicable to a contract can be:

(1) a basis for establishing the court's jurisdiction;[713] and/or

(2) a factor in determining the comparative appropriateness of a particular court.[714]

7.48 Additionally, under the recast Brussels I Regulation, determining a contract's applicable law can be a necessary step in identifying some other basis upon which jurisdiction can be established, such as the place of performance of a particular contractual obligation.[715]

7.49 A desire to exclude institutional influences, to decentralise control and to disintermediate transactions were all motivating factors in the early development of smart legal contracts (and DLT in particular). The law is, amongst other things, a regulatory institution. Parties entering into smart (legal) contracts, particularly those underpinned by DLT, may do so in the hope or expectation that such agreements are beyond the reach of the law.[716] Perhaps for this reason, the law applicable to smart legal contracts is an under-theorised area. As Professor Giesela Rühl has written:

> The law applicable to smart contracts is a neglected topic. At times it is even discarded as irrelevant or unnecessary. In fact, may authors claim that smart contracts especially when stored and executed with the help of blockchain

---

711 *R (Software Solutions Partners Ltd) v HM Customs & Excise* [2007] EWHC 971 (Admin) at [67].

712 See also *Quoine Pte Ltd v B2C2 Ltd* [2020] SGCA(I) 02 ("*Quoine*"), at [15], where the Singapore Court of Appeal emphasised that the parties' computer programs operated "deterministically", that is, the programs did "just what they were programmed to do and did not have the capacity to develop their own responses to varying conditions". Also Tech London Advocates, *Blockchain: Legal & Regulatory Guidance* (2020) p 40 (noting that a computer program does not have a "separate legal personality" from the contracting parties).

713 For example, under the Civil Procedure Rules 1998, Practice Direction 6B, para 3.1(6)(c).

714 Under the common law's *forum (non) conveniens* principle, a contract's applicable law is a relevant connecting factor: Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 12-034.

715 For example, under art 7 of the recast Brussels I Regulation – other than in relation to contracts for the sale of goods or the provision of services – a contractual obligation's place of performance is identified by determining which national law governs the contract, and then applying that governing law to determine the place of performance: Case 12/76 *Industrie Tessili Como v Dunlop AG* [1976] ECR 1473.

716 "Smart contracts do not need a legal system for their existence: they may operate without any overarching legal framework. De facto, they represent a technological alternative to the whole legal system": A Savelyev, "Contract Law 2.0: 'Smart' contracts as the beginning of the end of classic contract law" (2017) 26 *Information & Communication Technology Law* 116, 132. We discuss the necessity of an intention to create legal relations from para 3.63.

technology make contract law and, in fact, the entire legal system obsolete. "Code is law" is a frequently cited catchphrase.[717]

7.50 Nevertheless, it is clear that smart legal contracts of various kinds can be a source of enforceable legal obligations. When these obligations are breached or something goes awry (for example, the code does not operate as the parties intended), the law can be invoked to resolve disputes.[718] Whilst courts will always apply their own procedural law, it is common for them to apply foreign substantive law to resolve contractual disputes.

7.51 The rules that determine the law applicable to contractual disputes – known as choice of law rules – are those contained in the Rome I Regulation.[719] These rules are retained EU law under article 66 of the European Union (Withdrawal) Act 2018, and have been amended by statutory instrument – better to function as domestic legislation.[720] They apply to "contractual obligations" which, in this context, means "a legal obligation freely consented to by one person towards another".[721] Since a smart legal contract may be a source of contractual obligations, the law applicable to such obligations will be determined by the Rome I Regulation. Broadly speaking, the Rome I Regulation stipulates that parties may choose the applicable law, but that in the absence of such a choice, the applicable law will be determined by evaluating the factors that connect the contract to various jurisdictions.

7.52 Below, we consider the following issues related to applicable law.

(1) Whether a rejection of state law in favour of the rules contained in a platform's protocol is a choice that can (or should) be recognised under the Rome I Regulation.

(2) Whether it is possible to embody a choice of applicable law in code.

---

717 G Rühl, "Smart (legal) contracts, or: Which (contract) law for smart contracts?", in B Cappiello and G Carullo (eds), *Blockchain, Law and Governance* (2021) p 159.

718 Whilst smart legal contracts are, to varying degrees, code-based, "this code will not operate in a legal vacuum. Deployment of smart contracts in commercial settings will inevitably lead to disputes. For example, if smart contract code is flawed, incorporates a poorly drafted provision, or executes in a manner not intended by one of the parties, parties will likely turn to the legal system to resolve the contractual dispute": The Cardozo Blockchain Project, *Smart Contracts and Legal Enforceability* (October 2018) p 9.

719 Regulation on the law applicable to contractual obligations (EU) No 593/2008 Official Journal L 177 of 04.07.2008 p 6 ("Rome I Regulation").

720 The Law Applicable to Contractual and Non-Contractual Obligations (Amendment etc.) (EU Exit) Regulations, SI 2019 No 834. It may be more accurate to refer to these rules as "UK Rome I", because although they currently contain the same content as the Rome I Regulation, they may not necessarily do so in the future. Strictly speaking, this is the case for contractual obligations assumed after 17 December 2009. For contracts entered into between 1 April 1991 and 17 December 2009, the relevant rules are those of the Rome Convention. These are incorporated into English law in the Contracts (Applicable Law) Act 1990, as amended by the Jurisdiction, Judgments and Applicable Law (Amendment) (EU Exit) Regulations 2020, SI 2020 No 1574.

721 Case C-359/14 *Ergo Insurance SE v If P&C Insurance AS* [2016] RTR 14 at [14]. It is worth noting that subsequent decisions of the CJEU will continue to be relevant (if not determinative) to the future interpretation and effect of retained EU law: see section 6 of the European Union (Withdrawal) Act 2018.

(3) What factors can connect a smart legal contract to a particular jurisdiction for the purposes of identifying the contract's governing law under the Rome I Regulation.

(4) Whether there are likely to be difficulties in applying the special choice of law rules contained in articles 5, 6, 7, and 8 of the Rome I Regulation in the smart legal contract context.

7.53 We asked consultees about these issues in the call for evidence,[722] and draw on their responses throughout our discussion.

Party autonomy

Can parties choose a platform protocol as the applicable law?

7.54 The Rome I Regulation aims to promote party autonomy by stipulating that where parties have (expressly or implicitly) chosen the law applicable to their contractual obligations, courts will generally give effect to that choice.[723]

7.55 There could, at least in theory, be scenarios where parties have intended to create legal relations, but have purported to choose that their agreement be governed solely by the protocol of a particular platform.[724] Article 3(1) of the Rome I Regulation provides that a contractual obligation "shall be governed by the *law* chosen by the parties".[725] The term "law" refers to the law of a country.[726] To suggest that a platform protocol could be included as a possible choice within the meaning of article 3(1) sits uneasily with the prevailing view that the article's reference to "law" means the law of a country. We therefore consider, in agreement with Professor Andrew Dickinson, that because a protocol is not a "law" for the purposes of the Rome I Regulation, it cannot be validly chosen under article 3(1).[727]

7.56 The majority of consultees agreed that parties cannot currently choose for their smart legal contract to be governed by the rules of a platform's protocol, to the exclusion of the law of a country.[728] For example, Dr Benjamin Hayward, Dr Lisa Spagnolo, and Dr

---

722 Call for evidence, questions 49 to 52, paras 7.42 to 7.61.

723 Rome I Regulation, art 3(1). This is subject to the overriding application of certain mandatory rules: Rome I Regulation, art 9(1).

724 In the absence of any intention for their agreement to be legally binding, there is simply no contract; the applicable law question does not arise. See the discussion from para 3.63.

725 Rome I Regulation, art 3(1) (emphasis added).

726 *Beximco Pharmaceuticals Ltd v Shamil Bank of Bahrain* [2004] EWCA Civ 19, [2004] 1 WLR 1784 at [48]. See also P Torremans (ed), *Cheshire, North & Fawcett, Private International Law* (15th ed 2017) p 715. The authors explain that whilst it was originally proposed that the Rome I Regulation would empower parties to choose recognised bodies of non-state law (such as the UNIDROIT principles or the UN Convention on the International Sale of Goods), this provision was deleted from the final version of the Regulation.

727 Article 3(1) will "only validate a choice of a national legal system and not a choice of a non-State rules": A Dickinson, "Cryptocurrencies and the Conflict of Laws" in D Fox and S Green (eds), *Cryptocurrencies in Public and Private Law* (2019) para 5.37.

728 We asked consultees whether a rejection of state law in favour of the rules contained in a platform's protocol is or should be a choice that can be given effect to under article 3(1) of the Rome I Regulation: call for evidence, question 49 at para 7.42.

Drossos Stamboulakis (joint response) said that the answer was "an absolute and unequivocal no".

7.57 On the other hand, three consultees thought that the law would recognise such a choice under article 3(1). For example, Dr Robert Herian said that, under article 3(1) of the Rome I Regulation, parties may choose "the rules contained in a particular agreement, such as a contract for services or an online platform's protocol" to govern their relationship. The other consultees who suggested that parties could validly choose a platform's protocol were Katherine Graff and Cuneyt Eli. The latter said that this choice could be made where the state law "has not comprehensively covered the actions of a smart contract".

7.58 We remain of the view that it is not currently open to parties under article 3(1) of the Rome I Regulation to choose for their smart legal contract to be governed solely by a platform's protocol.

7.59 The view of Katherine Graff and Cuneyt Eli conceives of a platform's protocol filling in the gaps where the substantive law runs out. This view seems to be an inversion of the more widely held position, discussed below, that a protocol will be relatively incomplete as compared to a body of state law. In our view, smart legal contracts cannot exist in a legal vacuum. A state law is likely to be necessary to fill in the gaps. We also think that the view adopted by these two consultees elides the terms of a contract with the law that governs that contract. As discussed below, parties can agree that the terms of the platform's protocol are part of the contract between them. We think this is the better solution for reflecting the protocol – and still allows for state law to fill in any gaps.

Should parties be able to choose a platform protocol as the applicable law?

7.60 Most of the consultees who thought that parties could not choose a protocol as a governing law also expressed a view on whether or not this was a satisfactory state of affairs. A clear majority of consultees thought that it was; the law should not be reformed to enable the parties to make such a choice.

7.61 A clear argument against the idea that platform protocols could or should be capable of governing a contract is that such protocols will not contain enough rules to cover all eventualities that might arise in relation to a smart legal contract. As Dr Benjamin Hayward, Dr Lisa Spagnolo, and Dr Drossos Stamboulakis (joint response) said, "platform protocols (unlike State laws) are necessarily incomplete". They are, therefore, "an inadequate substitute for a governing law". Similarly, Allen & Overy said 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.

They provided the example of where the protocol does not make express provision "for what happens if performance becomes impossible or illegal".

7.62 The incompleteness and (therefore) inadequacy of protocols, as compared to bodies of national law, are compelling arguments against any suggestion that the law should

be changed to allow parties to choose for their smart legal contract to be governed solely by a platform's protocol.

Other considerations as to choice of law

7.63 Finally, consultees also made a number of further observations about:

(1) incorporating the rules of a protocol as contractual terms; and

(2) the meaning of "contractual obligations".

7.64 We discuss each of these in turn.

Incorporating a protocol as contractual terms

7.65 As mentioned above, although we do not consider that a platform's protocol could be an applicable law, its rules could be incorporated as terms of the parties' contract.

7.66 As Herbert Smith Freehills explained, 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". Relatedly, the LawTech Sounding Board said that it may 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". Catherine Phillips provided a comparator. She said that 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".[729]

7.67 Several consultees referred to the case of *Beximco Pharmaceuticals Ltd v Shamil Bank of Bahrain*, where the Court of Appeal considered (but ultimately rejected) the incorporation, as contractual terms, of particular principles of Sharia law.[730] An incorporation analysis is also consistent with the Court of Appeal's discussion in *Halpern v Halpern*.[731] In this case, Lord Justice Walker suggested that principles of Jewish law, although not a body of state law capable of governing a contract, were capable of being incorporated as terms of a contract to aid in interpretation.[732]

The meaning of "contractual obligations"

7.68 The choice of law rules in the Rome I Regulation apply to "contractual obligations". This term has been interpreted broadly as meaning "a legal obligation freely consented to by one person towards another".[733] It is not necessarily limited to

---

729 The "UCP 600" refers to the International Chamber of Commerce's Uniform Customs and Practice for Documentary Credits (ICC Publication No 600). This a set of rules which may be incorporated as terms of an agreement between parties to a letter of credit transactions.

730 [2004] EWCA Civ 19, [2004] 1 WLR 1784. We alluded to this case in passing in footnote 553 of the call for evidence.

731 [2007] EWCA Civ 291, [2008] QB 195.

732 *Halpern v Halpern* [2007] EWCA Civ 291, [2008] QB 195 at [30] to [38]. Both Sedley LJ and Carnwath LJ (as he then was) agreed with Walker LJ's discussion.

733 Case C-359/14 *Ergo Insurance SE v If P&C Insurance AS* [2016] RTR 14 at [44].

obligations that the law of England and Wales – or any other law, for that matter – regards as contractual in nature.[734]

7.69 In their response, however, Eversheds Sutherland suggested that it "might be preferable for legislation to make clear the extent of the phrase 'contractual obligations'". It seems that the underlying rationale for such legislation would be to provide greater certainty to parties as to when contractual choice of law rules, which apply to contractual obligations, would be triggered.

7.70 We think that any attempt to clarify this could be fraught with difficulties. It could risk drawing the boundary in the wrong place, and creating unprincipled distinctions. Such an approach would also seem to be contrary to the objectives of the Rome I Regulation, which is intended to apply to a category of obligations independent of any particular legal system's conception of contractual obligations. As Lord Justice Mance (as he then was) explained in *Raffeisen Zentralbank Osterreich AG v Five Star General Trading LLC*, when interpreting equivalent language in the previously applicable Rome Convention:

> National courts must clearly strive to take a single, international or "autonomous" view of the concept of contractual obligations that is not blinkered by conceptions – such as perhaps consideration or even privity – that may be peculiar to their own countries.[735]

Expressing a choice of law in code

7.71 Choices of applicable law expressed in natural language will not pose any particular problems for the application of the Rome I Regulation. However, the position appears to be more complex in relation to a coded choice of law clause. It has been suggested that "a choice of law can hardly be represented in algorithmic fashion – 'if this, then that'".[736] Even so, the majority of consultees said that it would be possible to encode a choice of law clause; some even provided practical examples.[737]

7.72 Peter Howes said that it is possible to encode an express choice of applicable law clause in a "Turing complete" programming language. From publicly available information, we understand a Turing complete programming language to be one which can be used to compute anything which it is possible to compute.[738] Conversely, a programming language is not Turing complete if there are things that it cannot compute that are able to be computed in another programming language. We

---

734 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 32-016.

735 [2001] EWCA Civ 68, [2001] QB 825 at [33] by Mance LJ (as he then was).

736 G Rühl, "Smart (legal) contracts, or: Which (contract) law for smart contracts?", in B Cappiello and G Carullo (eds), *Blockchain, Law and Governance* (2021) p 170.

737 We asked consultees whether an express choice of applicable law could be embodied in code. We also asked consultees to provide any practical examples of such a coded clause: call for evidence, question 50 at para 7.45.

738 For example, the programming language upon which Ethereum is built, which is called Solidarity, is Turing complete, and can therefore theoretically be used to compute "any problem of any complexity" that it is possible to compute: A Antonopoulos and G Wood, *Mastering Ethereum: Building smart contracts and DApps* (2018) ch 1, https://github.com/ethereumbook/ethereumbook/blob/develop/01what-is.asciidoc.

understand that Turing completeness is "very easy to achieve", and it is more common than not for a programming language to be Turing complete.[739]

7.73 D2 Legal Technology and the Law Society of England and Wales said that coding a choice of law clause "could simply be done through the setting of a variable (eg vGoverningLaw), to an appropriate value to ensure a common understanding". Allen & Overy said that coding a choice of law clause could also be effected in the following way. A variable, say, x or y, could be included at a particular place in the code, and would work in tandem with a protocol rule that prescribed that "x = English law, y = French law". Herbert Smith Freehills said that coding a choice of law clause could be achieved by way of natural language comments in the code.

7.74 We remain of the view that it is very difficult for parties to express a choice of law clause in code, whereby code we mean operational, deterministic code. Variables and natural language comments in the code are merely ways to embed data pertaining to the choice of law in the code of an agreement. These techniques do not however have operational effect. Nonetheless, we think it may be possible for parties to set up an algorithmic determination of governing law to alter the risk profile between the parties, or to avoid potential conflict of laws issues. For example, the parties could program the code such that, if the current operational state of the smart legal contract is X, the law of jurisdiction Y applies; if not, the law of jurisdiction Z applies. In this case, the coded provision could be said to have operational effect.

7.75 Suppose Alice (as lender) and Bob (as borrower) agree that the law of New York applies to their loan agreement but that, following an event of default under the agreement, the governing law will change to the law of England and Wales. Under this law, Bob may be required to pay a higher interest rate. The smart legal contract could track the status of repayments under the loan, trigger a change in the applicable law, and adjust the interest rate accordingly. Circumstances such as this move away from comments and placeholders to changing the operation of the agreement in much the same way as parametric insurance or other contractual arrangements that rely upon algorithmic computation. In this sense, it may be possible to "code" a choice of law clause, although this is premised on the circumstances triggering the shift in governing law being capable of being reduced to operational, deterministic code.

Best practice for choice of law clauses

7.76 Our view remains that it would be difficult for parties to include a coded choice of law clause in their smart legal contract. However, it would not be difficult for parties to include a comment or other natural language provision to this effect, and we think parties would be well advised to do so. This is particularly so given the relatively high threshold for finding an implied choice of law in the absence of an express provision – such an implied choice must be "clearly demonstrated".[740] Herbert Smith Freehills said that including a natural language choice of law clause may contribute to a finding of intention to create legal relations, and may "avoid issues around the interpretation of comments in code". The Digital Law Association said that they recommend that

---

739 A Antonopoulos and G Wood, *Mastering Ethereum: Building smart contracts and DApps* (2018) ch 1, https://github.com/ethereumbook/ethereumbook/blob/develop/01what-is.asciidoc.

740 An implied choice must be "clearly demonstrated by the terms of the contract or the circumstances of the case": Rome I Regulation, art 3(1). A choice cannot be imputed to the parties.

parties express choices of governing law in natural language provisions "for certainty and to avoid any possible error of malfunction in the coded nomination".

7.77 A choice of law clause is likely to provide both parties with increased certainty as to the law applicable to their smart legal contract, and the consequences of any wrongdoing. As Linklaters said:

> 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.

Future-gazing

7.78 Several consultees cast their gazes further forward, and imagined how choice of law clauses might develop in the future. For example, the Digital Law Association said that, "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". We understand this comment to be a suggestion that it may be possible to have an oracle-style input that connects a smart legal contract to the entirety of a codified national legal system. Instead of providing that the governing law is, for example, French law, the contract would provide that the governing law is X, where X is an oracle-style input that provides the smart legal contract with all of the rules of French law. This would, presumably, update over time, and so ensure that the smart legal contract was always cognisant of developments in French law.

7.79 Relatedly, D2 Legal Technology said that a smart legal contract could have "a judge and court as an oracle-based input". We understand this comment to mean that a smart legal contract could receive directly the outcome of a decision by a particular court, and thereby automatically trigger certain consequential actions.

7.80 These discussions of future forms of choice of law clauses constitute speculative, but interesting, examples of the innovative opportunities that await exploration in the smart legal contract space. Although there may be certain obstacles to the particular examples given – for example, the Digital Law Association's suggestion (as we understand it) that presupposes that a body of national law could be fully codified – we are nevertheless grateful to consultees for their stimulating, future-orientated discussion.

Connecting a smart legal contract to a legal system for the purposes of identifying the applicable law

7.81 Where the contracting parties have not chosen an applicable law, the Rome I Regulation provides that the law applicable will be determined by a connecting factor. Articles 4(1) and 4(2) of the Rome I Regulation contain a series of default rules, which can be overridden in exceptional cases by the rule in article 4(3).

7.82 Article 4(1) sets out rules that determine the law applicable to particular types of contracts. For example, a sale of goods contract is governed by the law of the seller's habitual residence. A contract relating to a property right in immovable property, or to a tenancy in immovable property, is governed by the law of the country where the

property is situated. These rules have as their connecting factor either one party's habitual residence, or the place of a real-world aspect (such as the location of immovable property). Subject to difficulties in identifying counterparties, these types of connecting factors do not appear to pose any novel problems in the smart legal contract context.[741] For example, a rule that a sale of goods contract is governed by the law of the seller's habitual residence will, where applicable, operate in the same way for a smart sale of goods contract as for a traditional sale of goods contract.[742]

Characteristic performer

7.83 Article 4(2) provides that if none of the rules in article 4(1) applies, the law applicable to a contract is that of the jurisdiction where the party required to effect the characteristic performance of the contract (the contract's "characteristic performer") has their habitual residence. A contract's characteristic performer is identified by looking for the party whose performance is emblematic of the contract.[743] This involves identifying the particular obligation that is peculiar to the type of contract under consideration, and which distinguishes that contract from other types of contracts.[744] For example, in contracts involving a payment obligation, the characteristic performance is the performance for which payment is due, and the characteristic performer is the party under the obligation to render that performance.[745]

7.84 However, given the automated nature of certain aspects of performance in the smart legal contract context, it might be counterintuitive to look for such a contract's characteristic performer. The more automated a smart legal contract is, the more that is so. In the context of automated performance, the smart legal contract's characteristic performer is likely to be the person that, but for the automation, would have performed the obligation that is characteristic of the type of contract under consideration. In other words, the smart legal contract's characteristic performer will be the person required to render the performance that is characteristic of that type of contract, even if the actual performance of that duty is automated. This accords with the fact that the law already recognises that parties need not personally perform their contractual obligations.

---

741 See G Rühl, "The Law Applicable to Smart Contracts, or Much Ado About Nothing?", *Oxford Business Law Blog* (January 2019), https://www.law.ox.ac.uk/business-law-blog/blog/2019/01/law-applicable-smart-contracts-or-much-ado-about-nothing.

742 Assuming, of course that the seller can be identified. We discuss the problems of identity in the smart legal contract context from para 7.14.

743 Recital 19 of the Rome I Regulation stipulates that "the characteristic performer of the contract should be determined having regard to its centre of gravity".

744 "The object of the doctrine of characteristic performance is to isolate the obligation incumbent on one of the parties which is peculiar to the type of contract in issue, or which marks the nature of the contract, and thereby link the contract to the social and economic environment of which it will form a part": Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 32-077.

745 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 32-077. Additionally, "characteristic performance is a somewhat abstract notion: it is not the payment of money but performance for which such payment is due": H Beale (ed), *Chitty on Contracts* (34th ed 2021) para 33-113.

Other connecting factors

7.85 Articles 4(1) and 4(2) of the Rome I Regulation connect a contract to a system of applicable law by reference to a single, determinative connecting factor. Article 4(3) provides that the system of law designated by either article 4(1) or article 4(2) can be overridden if it is "clear from all the circumstances of the case" that the contract is "manifestly more closely connected" with some other legal system. In such a case, the contract will be governed by the law of that legal system. Article 4(4) provides that if it is not possible to determine the law applicable to a contract by applying articles 4(1), 4(2), or 4(3), then the contract is to be governed by the law of the jurisdiction with which it is "most closely connected".

7.86 This raises the issue of how to evaluate the connections between a contract and different legal systems. Referring to the comparable provisions of the Rome Convention 1980, this task has been explained by the CJEU as requiring a court to:

> conduct an overall assessment of all the objective factors characterising the contractual relationship and determine which of those factors are, in its view, most significant.[746]

7.87 In principle, the range of possible connecting factors is limitless. Generally, courts will look to factors such as the parties' residence and business activities, and to the details of their contractual relationship. This includes matters such as the place(s) of performance of the contract, as well as the language of the contract.[747]

7.88 It is clear that there is a continuity between the connecting factors that apply to non-smart legal contracts, and the connecting factors that apply to smart legal contracts. For example, Herbert Smith Freehills considered "that many of the same connecting factors that apply to regular contracts will continue to be applicable to smart contracts, depending on the circumstances".

7.89 However, there may be a number of novel connecting factors in the smart legal contract context, or factors which apply in a specific way to smart legal contracts. We include the list of factors suggested by consultees below.[748] The task of evaluating a smart legal contract's connecting factors will be difficult, given the multifarious connections that such a contract may have to a variety of different jurisdictions.[749] The editors of the European Association of Private International Law Blog have expressed the problem in the following terms:

> It will be challenging to find proper connecting factors … information is spread on computers and servers all around the world and often there is no operator controlling the process. For these reasons, finding the most significant or closest connection for

---

746 Case C-305/13 *Haeger & Schmidt GmbH v Mutuelles du Mans Assurances IARD* (23 October 2014) at [49].

747 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 32-080.

748 From para 7.92. We asked consultees what factors are capable of connecting a smart legal contract to a particular jurisdiction, for the purposes of articles 4(3) and 4(4) of the Rome I Regulation: call for evidence, question 51 at para 7.59.

749 Call for evidence, para 7.56.

the blockchain and smart contracts creates significant headaches, more so than the internet did at the time of its introduction.[750]

7.90 The greater the number of connections that a contract can have to different jurisdictions, the harder the task of evaluating that contract's connecting factors. Smart legal contracts are likely to give rise to a greater variety of connections to different legal systems than non-smart legal contracts. Some of these connections will be relevant; others will be more tenuous or arbitrary. Overall, however, the task of determining the legal system with which a smart legal contract has its closest connection is likely to be more difficult than it would be in relation to a non-smart legal contract.

7.91 Nevertheless, the task will not be fundamentally different in nature. A court will look to the same types of factors that it would look to for a traditional contract, and conduct the same fact-sensitive enquiry. As the Chancery Bar Association and Commercial Bar Association (joint response) said, "the courts are able to grapple with these areas of difficulty by applying existing principles", which "do not indicate the need for legislative reform". In their view, "identifying appropriate connecting factors will obviously be a fact-sensitive exercise in an individual case".

Connecting factors that are specific to smart legal contracts

7.92 Consultees identified a number of specific examples of connecting factors that could be relevant in the context of smart legal contracts.

(1) The identities, habitual residences, and domiciles of the parties (and/or of their agents).

(2) The place where any real-world performance takes place.

(3) The location of the nodes running the smart legal contract. However, this was rejected as a relevant connecting factor by Allen & Overy, on the basis that it "may well be entirely arbitrary".

(4) The location of the party who instigates the creation of the smart legal contract.

(5) The place where the relevant smart legal contract platform is based.

(6) The domicile of the ledger's gatekeeper/controller, if the relevant ledger is permissioned.

(7) The law governing any closely related contracts.

(8) The location of any private key. The Chancery Bar Association and Commercial Bar Association (joint response) noted that on one view this was "likely to be the most significant connecting factor" because the private key is the tool for

---

[750] Editors, "Destination Aarhus: Lehmann on Blockchains and Smart Contracts", *European Association of Private International Law Blog* (28 February 2020), https://eapil.org/2020/02/28/destination-aarhus-lehmann-on-blockchains-and-smart-contract.

effecting transfers, but on another view the key's location may be either "arbitrary" or difficult to identify, or located in multiple places.

(9) The location of any real-world assets to which the smart legal contract relates.

(10) The location of any cryptoasset to which the smart legal contract relates. A number of consultees referred to the judgment of Mr Justice Butcher in *Ion Science v Persons Unknown ("Ion Science")*.[751] In that case, which was a without notice hearing for urgent injunctive relief, the court found that there was a good arguable case that a cryptoasset was located in the place where its owner was domiciled.[752] We discuss the location of a cryptoasset, as well as the more recent decision of HHJ Pelling QC in *Fetch.AI Ltd v Persons Unknown*,[753] in more detail below.

7.93 We think that this is a useful checklist for determining the applicable law of a smart legal contract under articles 4(3) and 4(4) Rome I Regulation. For example, the place where any real-world performance takes place or the location of any real-world assets to which the smart legal contract relates may be helpful connecting factors (where applicable). Other factors suggested, such as the identities, habitual residences, and domiciles of the parties, or the location of the nodes running the smart legal contract, may be trickier to apply (or less relevant) in the smart legal contract context, as we discuss above.

Choice of law rules for special types of contracts

7.94 The Rome I Regulation contains special choice of law rules that apply to contracts of carriage (article 5), consumer contracts (article 6), insurance contracts (article 7), and individual employment contracts (article 8).

7.95 These special rules apply to particular contractual relationships that typically involve a significant imbalance in information or in bargaining power. Broadly speaking, these special rules are aimed at providing greater protection for the weaker party in a contractual relationship, by limiting the parties' capacity to choose the applicable law.[754]

7.96 In general, we do not anticipate that the special choice of law rules contained in articles 5, 6, 7, and 8 will cause any particular or novel problems in the smart legal contract context. The majority of consultees agreed.[755] However, there may be some initial difficulties in applying the existing rules to new factual scenarios.

7.97 The LawTech Sounding Board suggested that, in relation to consumer contracts, an inability to identify and locate a counterparty risked undermining the effectiveness of

---

751 (unreported) (21 December 2020) ("*Ion Science*").

752 Butcher J adopted the analysis of Professor Andrew Dickinson in "Cryptocurrencies and the Conflict of Laws" in D Fox and S Green (eds), *Cryptocurrencies in Public and Private Law* (2019).

753 [2021] EWHC 2254 (Comm).

754 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018), ch 33.

755 We asked consultees whether they were aware of, or foresaw, any difficulties in the application of these rules in the context of smart legal contracts: call for evidence, question 52 at para 7.61.

any protection afforded to the weaker party by the special choice of law rules. We have discussed the challenges of identifying counterparties elsewhere.[756] In relation to employment contracts, Herbert Smith Freehills said, "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".

7.98 Herbert Smith Freehills also raised the issue of whether the fact that a consumer can access a particular smart legal contract platform from a country means that a professional who uses that platform to conclude contracts with consumers "directs" their activities towards that country (for the purposes of article 6). This will be a fact-sensitive question, and is likely to depend upon the particular commercial practices of the relevant professional.

7.99 In two joined cases that considered equivalent language in article 15 of the (non-recast) Brussels I Regulation,[757] the CJEU held that the fact that a professional has advertised over the internet "does not invariably demonstrate an intention of the [professional] to direct its activity to each and every country where the site is accessible".[758] The CJEU noted that:

> this method of communication inherently has a worldwide reach, advertising on a website by a [professional] is in principle accessible in all States … without any need to incur additional expenditure and irrespective of the intention or otherwise of the [professional] to target consumers outside the territory of the State in which it is established.[759]

7.100 Accordingly, the mere fact that a website could be accessed in a particular country did not, without more, mean that professionals making use of it were directing their activity towards that country. What is required is evidence of an "intention to establish commercial relations with consumers" from that country.[760] We think that the same is true in the smart legal contract context. Professionals cannot control where a consumer may access a particular platform to conclude smart legal contracts, and the mere fact of access from a particular country is unlikely to be sufficient (on its own) to establish that a professional "directs" their activities towards it.

PERFORMANCE, BREACH, ACTS, AND ENRICHMENT

7.101 Rules of jurisdiction are often grounded in a legally significant connection between a contractual dispute and a particular legal system. It is that connection which engages the interests of the relevant legal system, and (at least in part) justifies the courts of that legal system asserting jurisdiction in relation to the dispute. The process of

---

756 From para 7.27.

757 Now encapsulated in article 17 of the recast Brussels I Regulation.

758 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 33-136, referring to Joined cases C-585/08 and C-144/09 *Pammer v Reederei Karl Schluter GmbH*; *Hotel Alpenhof GmbH v Heller* [2011] 2 All ER (Comm) 888, [2012] Bus LR 972.

759 Joined cases C-585/08 and C-144/09 *Pammer v Reederei Karl Schluter GmbH*; *Hotel Alpenhof GmbH v Heller* [2011] 2 All ER (Comm) 888, [2012] Bus LR 972 at [68].

760 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 33-136.

identifying connecting factors between a smart legal contract and different legal systems is likely to prove complicated for the purpose of establishing jurisdiction. As Professor Andrew Dickinson has observed:

> Rules of jurisdiction and applicable law operate principally on the basis of territorial connecting factors whose efficacy depends on the ability to locate acts and actors within the territory of a particular legal system, and whose rationale depends on the existence of a real and substantial connection to that legal system. Incorporeal (intangible) property and, more recently, Internet activities have placed a strain upon this territorial paradigm.[761]

7.102 Below, we consider two archetypal, but – in the smart legal contract context – potentially problematic, connecting factors: the place of breach and the place of performance of a contractual obligation. The former is a connecting factor in para 3.1(7) of Practice Direction 6B of the Civil Procedure Rules 1998. The latter is a connecting factor in article 7(1)(a) of the recast Brussels I Regulation, and in article 5(1)(a) of the Lugano Convention.

7.103 In the call for evidence, we suggested that because a breach was a failure of performance, these two concepts covered essentially the same territory.[762] However, Herbert Smith Freehills pointed out that this will not always be the case; for example, "where there is an express repudiation of the contract occurring in a place other than the place of performance". In this case, the place of breach and the place of performance will not be the same. As such, whilst these two connecting factors may lead to the same court having jurisdiction in certain circumstances, they are not synonymous or equivalent concepts.

The place of breach and the place of performance

7.104 Jurisdiction can be based on the fact that a significant contractual event occurred, or was due to occur, in a particular place. For example, the jurisdiction of a court in England and Wales may be based upon the fact that England and Wales is the place where the contract was breached.[763] Under article 7(1)(a) of the recast Brussels I Regulation and article 5(1)(a) of the Lugano Convention, jurisdiction may be based on the place of performance of the contractual obligation in question.

7.105 As to identifying the place of breach, the starting point is that a contract can be breached in three ways.[764] Namely:

(1) an express repudiation of the contract;

(2) an implied repudiation of the contract; or

---

761 A Dickinson, "Cryptocurrencies and the Conflict of Laws" in D Fox and S Green (eds), *Cryptocurrencies in Public and Private Law* (2019) p 97.

762 Call for evidence, fn 577.

763 Civil Procedure Rules 1998, Practice Direction 6B, para 3.1(7). We discuss another significant contractual event that can ground a court's jurisdiction – the place of contract formation –from para 7.18.

764 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 11-194.

(3) a failure to perform.[765]

7.106 An express repudiation takes place in the country where the repudiating party is located when they inform their counterparty that they no longer intend to perform their obligations under the contract. An implied repudiation, which is a repudiation implied by the doing of an act inconsistent with contractual performance, takes place in the country where that inconsistent act occurs. A failure to perform takes place in the country in which performance was due.[766]

7.107 In Chapter 5, we suggest that the automated nature of a smart legal contract's performance is likely to make certain types of repudiatory breach – such as a refusal to perform the contract at all – less common in practice.[767] Accordingly, although a court's jurisdiction can be based on the fact that the contract was breached in England and Wales, depending on the type of breach in question, we think this jurisdictional gateway may be less relevant for smart legal contracts than for traditional contracts.

7.108 In relation to the place of performance of a contract, the European frameworks provide specific rules for two types of contracts. For contracts for the sale of goods, the place of performance is the country where the goods were (or should have been) delivered.[768] For contracts for the provision of services, the place of performance is the country where the services were (or should have been) provided.[769]

7.109 We think that smart legal contracts are unlikely to give rise to any novel difficulties in applying these particular European rules. For smart legal contracts that automate the sale and delivery of goods, the place of performance is the country where the goods were (or should have been) delivered. Similarly, for smart legal contracts that automate the provision of services, the place of performance is the country where the services were (or should have been) provided. Introducing an element of automation into these contracts does not create any novel difficulties in identifying the place of performance.

7.110 Indeed, in so far as a smart legal contract automates the performance of an obligation that would otherwise have been physically performed in the real world, the task of identifying the place of performance should not pose any special challenges. Herbert Smith Freehills said:

> We agree … 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.

---

765 A "failure to perform" is broad enough to encompass both a refusal to perform the contract, and defective performance. See A Burrows, *A Restatement of the English Law of Contract* (2nd ed 2020) p 112.

766 For a discussion of these three ways in which a contract can be breached, see Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) paras 11-194 to 11-203.

767 We discuss repudiatory breach in the smart legal contract context from para 5.106.

768 Recast Brussels I Regulation, art 7(1)(b); Lugano Convention, art 5(1)(b).

769 Recast Brussels I Regulation, art 7(1)(b); Lugano Convention, art 5(1)(b).

7.111 However, for particular types of smart legal contracts, the place of performance of a coded obligation may prove more difficult to discern. For example, a smart legal contract that involves the on-chain transfer of a quantity of cryptocurrency in exchange for payment in fiat currency. In this case, ascertaining the place of performance may prove more challenging because it is difficult to say precisely where the on-chain transaction is performed.[770] Digital objects (and actions in relation to them) are less obviously locatable in a particular location. The Digital Law Association said that:

> 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.

7.112 Additionally, Anurag Bana suggested that the task of identifying a place of performance will be even more difficult in more complicated factual scenarios, such as when users of a DLT system make use of multi-signature arrangements.[771]

7.113 The consensus that emerged amongst consultees was that the usefulness of a rule based on the place of performance will depend upon the particular factual situation under consideration.[772] The difficulties inherent in identifying a place of performance are indicative of the broader challenges of determining jurisdiction in relation to contracts that do not involve real world performance. We think that this is also indicative of a general observation: the further the factual scenarios are from traditional contractual settings, the greater the difficulty in applying existing legal rules and principles to those new scenarios.

Place(s) of performance when that performance occurs wholly on a distributed ledger

7.114 Several consultees noted that when performance occurs, or is due to occur, on a distributed ledger, certain candidates for the "place of performance" can seem arbitrary or artificial. For example, Allen & Overy could envisage "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". In their view, "the location of participating nodes would be a particularly clear example of that".

---

770 In the call for evidence, we noted that performance in this example could be said to take place in: (i) the place where the person with knowledge of the private key was located; (ii) every place in which there is a participating node validating the transaction; or (iii) in some other place(s), such as the place of the claimant's centre of interests, or the place(s) that the offeror has targeted with their offer. Call for evidence, para 7.70.

771 Broadly speaking, a multi-signature arrangement is a way of securing an asset on a DLT system whereby either more than one person's signature is required in order to transfer it, or the necessary (single) signature is split into fragments (each of which is stored with a different person) which must be reassembled to effect a transfer. Typically, a multi-signature arrangement will stipulate that a particular subset of signatures (or fragments) is required to effect a transfer. For example, a particular arrangement may provide that two out of three signatures are required. For discussion, see A Antonopoulos and G Wood, *Mastering Ethereum: Building smart contracts and DApps* (2018) ch 6, https://github.com/ethereumbook/ethereumbook/blob/develop/01what-is.asciidoc.

772 We asked consultees whether they thought that a rule of jurisdiction based on the place of contractual performance could be usefully applied where performance takes place virtually, on a distributed ledger: call for evidence, question 53 at para 7.72.

7.115 Catherine Phillips implied a similar concern about arbitrary or fortuitous results:

> the location of the nodes does 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.

Similarly, DLA Piper UK gave the example of a hypothetical rule that determined the place of performance of an on-chain cryptocurrency transfer by reference either to the location of the transferor or the transferee. DLA Piper UK said that "such location is subject to the movements of the payor or payee". Furthermore, they thought that "such a transfer might be made by a 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".

7.116 However, there was a lack of consensus amongst consultees about the place of performance of an on-chain transfer of a quantity of cryptocurrency. The Chancery Bar Association and Commercial Bar Association (joint response) suggested that, generally speaking, the location of contractual performance "ought to be tied to the real-world actors responsible for bringing about performance".

7.117 In the Chancery Bar Association and Commercial Bar Association's view, therefore, the place of performance of actions that take place on a distributed ledger should be tied to the domicile of the party performing the relevant obligation. In the example of an on-chain transfer of an amount of cryptocurrency, the place of performance would therefore be the place of domicile of the transferor of the cryptocurrency, if this is the obligation under consideration.

7.118 In contrast, Herbert Smith Freehills suggested that, in the example of an obligation to transfer an amount of cryptocurrency on-chain, "the place of performance should be the same as the location of the cryptocurrency after it has been transferred".[773] They noted that following *Ion Science*, this would therefore likely be the place of domicile of the transferee.[774]

7.119 We tend to agree that it may be more intuitive to interpret the place of performance as the location where the cryptocurrency is after it has been transferred, if it is possible to identify such a place. By way of analogy, the relevant rule under the recast Brussels I Regulation identifies the place of performance of a sale of goods contract with the country where the goods were (or should have been) delivered, rather than the country where the delivering party was located or domiciled.[775]

---

773 Herbert Smith Freehills also said that in many cases, the performance of contractual obligations "will result in practical consequences in the real world, for example, payment of traditional currency or delivery of goods" and that in these cases "the place of performance of the contract may be determined in the traditional fashion".

774 Herbert Smith Freehills observed, however, that the *Ion Science* decision "does not decide this point definitively".

775 It is, however, an open question whether certain digital assets can fall within the meaning of the term "goods". We discussed this issue in our call for evidence on digital assets: Digital assets (2021) Law Commission Call for Evidence paras 2.43 to 2.49.

Wider reform of Practice Direction 6B

7.120 Allen & Overy, in discussing whether there could be a new jurisdictional gateway in Practice Direction 6B for smart legal contracts, said:

> As to whether an alternative connecting factor should be identified, we can conceivably [see] 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.

7.121 This is beyond the scope of our smart legal contracts project. However, it is an issue that we may revisit as part of our future work on private international law and emerging technology.

The place of acts giving rise to an alleged liability to make restitution, and the place of enrichment

7.122 In relation to smart legal contracts, performance can be both automatic and unstoppable. Accordingly, we have suggested that restitutionary remedies may assume greater significance in relation to smart legal contracts than traditional contracts.[776]

7.123 Under the common law rules, a court may have jurisdiction to hear a restitutionary claim that is connected to a contract under the contractual gateways in para 3.1(6) of Practice Direction 6B of the Civil Procedure Rules 1998.[777] Additionally, jurisdiction can be based on restitutionary factors such as a country being the place of acts giving rise to an alleged liability to make restitution, or the place of enrichment.[778] We envisage that identifying such locations for the purposes of restitutionary remedies would present similar challenges to locating the place where a smart legal contract is formed.[779]

JURISDICTION RULES FOR SPECIAL TYPES OF CONTRACTS

7.124 Certain types of contracts, which commonly involve a significant asymmetry in information or (bargaining) power between the parties, engage specialised jurisdiction rules. These rules are usually tailored towards giving the weaker party either more choice of where they can sue or more protection in relation to where they can be sued. In the call for evidence, we discussed insurance contracts, consumer contracts,

---

776 We discuss the increased relevance of restitutionary remedies in the smart contract context in Chapter 5 from para 5.89. The law applicable to restitutionary obligations which relate to a contractual relationship between parties is the law applicable to that contract: Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) para 36R-001.

777 *Albon v Nazar Motor Trading* [2007] EWHC 9 (Ch), [2007] 1 WLR 2489.

778 Civil Procedure Rules 1998, Practice Direction 6B, para 3.1(16).

779 We made this suggestion in the call for evidence, at para 7.74. Although we did not ask a specific question about this, no consultees suggested an alternative view.

and employment contracts by reference to the rules in recast Brussels I Regulation.[780] There, we made the point that the smart nature of an insurance product, consumer contract or employment contract would not seem to affect the operation of these rules.

7.125 Although the recast Brussels I Regulation has fallen away, the rules in relation to consumer contracts and employment contracts are now replicated in the new sections 15A to 15E of the Civil Jurisdiction and Judgments Act 1982. We continue to think that the smart nature of any consumer or employment contract is unlikely to affect the operation of these rules.

COMPARATIVE APPROPRIATENESS

7.126 Once a court has established a basis for jurisdiction under the common law rules, the court must then determine whether it is appropriate for it to accept jurisdiction, and adjudicate upon the contractual dispute before it.

7.127 This is an important point of difference between the common law rules and the European regimes. Under the former, the court retains a discretion to refuse jurisdiction under the *forum (non) conveniens* principle, if England and Wales is not the proper place for the claim to be brought. In contrast, under the European rules, the court has no discretion to decline to hear a dispute. As Lord Justice Gross explained in *Yukinson International UK BV v Merinson*, the European regimes:

> introduced jurisdictional rules differing markedly from those hitherto prevailing at common law. In place of flexibility and judicial discretion (including the doctrine of forum non conveniens), fixed rules were introduced, prioritising certainty and predictability.[781]

7.128 The contrasting rationales underpinning the two approaches can be explained as follows. The common law rules aim to ensure that each dispute is litigated in its most appropriate forum. Expansive bases of jurisdiction are counter-balanced by a discretion to refuse jurisdiction in circumstances where it is not appropriate to hear the claim. In contrast, the European frameworks aim to allocate jurisdiction through the systematic application of clear, certain, and predictable rules. If a basis for jurisdiction is made out, the court has no discretion to decline it.[782]

7.129 Under the common law rules, the evaluation of the comparative appropriateness of England and Wales as a forum for the dispute is a practical and fact-sensitive enquiry.[783] This evaluation is usually conducted in two stages. Even if a basis for

---

780 Call for evidence, para 7.75.

781 [2019] EWCA Civ 830, [2020] QB 336 at [1].

782 Case C-281/02 *Owusu v Jackson* [2005] ECR I-1383.

783 Lord Collins of Mapesbury and J Harris (eds), *Dicey, Morris & Collins, The Conflict of Laws* (15th ed 2018) paras 12-030 and 12-034.

jurisdiction is made out, a court will only have jurisdiction to hear a contractual claim if:[784]

(1) there is no clearly more appropriate court in which the dispute could be heard; or

(2) there is another clearly more appropriate court to hear the dispute, but the claimant would be denied justice if they were refused access to the courts of England and Wales.

7.130 As the Chancery Bar Association and Commercial Bar Association (joint response) said:

> 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.

7.131 We have identified the following factors as relevant to the first stage of the enquiry. This list includes factors we suggested in our call for evidence, and additional factors suggested by consultees which we agree are relevant.[785]

(1) The place of formation of the smart legal contract.

(2) The location of the contractual subject matter.

(3) The place of performance or breach.

(4) The location of the nodes participating in the distributed ledger, if applicable.

(5) The location of the contracting parties, and any other relevant witnesses and evidence.

(6) The law applicable to the smart legal contract, and the complexities of the legal issues raised.

---

784 The classic articulation of the *forum (non) conveniens* test is the judgment of Lord Goff in *The Spiliada* [1987] AC 460. The burden of proof at the first stage is on the claimant. The burden of proof at the second stage is on the defendant. However, in *VTB Capital Plc v Nutritek International Corp* [2013] UKSC 5, [2013] 2 AC 337, the Supreme Court held that whilst that remained true for cases where jurisdiction was based on the defendant's presence in England and Wales, for "service out" cases (where the court is being asked for permission to serve the claim form on a defendant out of the jurisdiction) the position is different. Here, the two stages of the test are combined into one – the claimant must prove that England and Wales is "clearly or distinctly the appropriate forum": at [44], by Lord Mance.

785 We asked consultees about the factors that could connect a claim in relation to a smart legal contract to a particular jurisdiction, for the purposes of evaluating the appropriateness of a forum: call for evidence, question 54 at para 7.85.

(7) The domicile(s) of the contracting parties (suggested by the Chancery Bar Association and Commercial Bar Association (joint response), the LawTech Sounding Board, and Katherine Graff).[786]

(8) The contracting parties' centres of main interest (suggested by Catherine Phillips).

(9) The location of the smart legal contract platform (suggested by Herbert Smith Freehills).

7.132 As to the second stage of the enquiry, the assessment is similarly fact-sensitive, and that the court can consider "all of the circumstances of the case".[787] A relevant consideration at this second stage, unique to the smart legal contract context, would be whether, as a matter of procedure, certain types of claims in relation to smart legal contracts were barred in the otherwise clearly more appropriate forum.

THE MOST PROBLEMATIC JURISDICTIONAL RULES AND ISSUES, INCLUDING DIGITAL LOCATION

7.133 We ended Chapter 7 of our call for evidence by giving consultees the opportunity:[788]

(1) to identify the jurisdiction rules that they considered would be the most problematic in the smart legal contract context; and

(2) to say whether or not they agreed with our analysis of the issues as described in the call for evidence.

7.134 Consultees also took this final question as an opportunity to reiterate the utility of jurisdiction and choice of law clauses as means of mitigating against legal uncertainty.

The most problematic jurisdiction rules and issues

7.135 Consultees expressed a variety of views as to the most problematic rules and issues in relation to allocating jurisdiction in smart legal contract disputes. For example, DLA Piper UK said that "all rules for establishing jurisdiction are likely to be problematic in certain circumstances". In particular, they said that it would be particularly difficult to identify the contracting parties and their locations, and to determine the place of contractual performance and the location of contractual subject matter.

7.136 Catherine Phillips said that the most problematic issues were identifying the place in which a smart legal contract is formed, and locating the participating nodes in a distributed ledger system. Similarly, Stephen Smoktunowicz said that the greatest problems would be encountered in locating objects and actions that exist within, or take place on, a distributed ledger. The Chancery Bar Association and Commercial

---

786 The usefulness of a party's domicile, as a factor in assessing comparative appropriateness, is however subject to the difficulties that we have discussed above about identifying counterparties in the smart legal contract context: paras 7.14 to 7.17.

787 *The Spiliada* [1987] AC 460, 478D, by Lord Goff.

788 Call for evidence, question 55 at para 7.86.

Bar Association (joint response) pointed to the issue of "identifying the situs of wholly internal DLT assets".

7.137 The LawTech Sounding Board said that there would be particular difficulties involved in "identifying a relevant physical territory in which to found jurisdiction when a transaction takes place entirely virtually" and "establishing the identify and location of the contracting parties". Florian Idelberger identified the greatest challenge as "gathering all the evidence" for a dispute, given that it may be dispersed across many different jurisdictions. Linklaters said that the most problematic issue was determining the location of assets held solely through a distributed ledger. They added that:

> 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.

Agreement with our analysis, and points of disagreement

7.138 The majority of consultees agreed with our analysis of the relevant issues, albeit that Herbert Smith Freehills foreshadowed recent private international law developments by cautioning that:

> 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).

7.139 However, two consultees expressed points of disagreement. First, the Chancery Bar Association and Commercial Bar Association (joint response) said that they did not think that the location of participating nodes in a distributed ledger system was a useful connecting factor. In their view, it would be difficult to identify a particular node as having a suitably substantial connection to any particular transaction, and nodes may be (from the perspective of the contracting parties) spread arbitrarily across the globe.

7.140 As we have discussed above, we accept this point, and the arguments made in support of it. Indeed, we noted in the call for evidence that Professor Giesela Rühl described the location of a system's nodes as "arbitrary", and doubted its relevance as a connecting factor.[789] Although the location of a participating node is a connection that can be drawn between a smart legal contract and a legal system, it might be that less weight is attributed to it as a connecting factor.

7.141 The second point of disagreement came from Luminita Procopie, who said:

> 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.

7.142 We agree that the term "smart contracts", as that term was originally coined, refers to computer programs that automatically perform certain functions. As we explain in Chapter 2, such programs are not contracts in any legal sense, but rather code that

---

[789] Call for evidence, fn 573.

perform in a pre-specified way upon the satisfaction of certain conditions.[790] However, when we speak of "smart legal contracts", we are referring to that sub-set of computer programs which perform or define the obligations of a legally binding contract. We think that the Rome I Regulation, and the choice of law rules contained therein, applies to the binding contractual obligations that arise from, or are performed by, smart legal contracts as we use the term.

The utility of jurisdiction and choice of law clauses

7.143 Several consultees reiterated the importance of parties making use of jurisdiction and choice of law clauses, to mitigate legal risk in relation to smart legal contract disputes.

Conclusion

7.144 Broadly speaking, the two issues that were identified by consultees as the most problematic were:

(1) determining the location of digital assets; and

(2) determining the location of particular actions, such as the place of performance or the place of breach, when those actions "take place" on a distributed ledger.

7.145 We agree that the problem of digital location – that is, the difficulty of ascribing real-world locations to digital actions and digital objects – is amongst the most significant challenges that private international law will have to overcome in relation to emerging technology, including smart legal contracts.

7.146 We will consider these issues and potentially propose solutions as part of our future project on conflicts of laws in the context of emerging technology. In the meantime, marketplace actors, their legal advisers, courts, and regulators are already having to grapple with questions such as where a cryptoasset is located for jurisdiction and applicable law purposes. For example, this issue has recently been considered in two first instance decisions of the High Court: *Ion Science* and *Fetch.AI Ltd v Persons Unknown*.[791] These cases involved applications for urgent injunctive relief to prevent the dissipation of quantities of cryptocurrencies of which the claimants alleged that they had been fraudulently deprived. In both cases, the courts adopted Professor Andrew Dickinson's view that a cryptoasset is located in the place where its owner is domiciled.[792] On the other hand, HMRC has taken the view that, for tax purposes, an exchange token (a cryptoasset that is native to a cryptoasset exchange) is located in the place where its beneficial owner is resident.[793]

---

790 At para 2.21.

791 [2021] EWHC 2254 (Comm).

792 *Ion Science Ltd v Persons Unknown* (unreported) (21 December 2020) at [13]; *Fetch.AI Ltd v Persons Unknown* [2021] EWHC 2254 (Comm) at [14]. In both cases, the owner of the cryptocurrency was domiciled in England.

793 HM Revenue & Customs, *HMRC internal manual: CRYPTO22600 – Cryptoassets for individuals: Capital Gains Tax: determining location of exchange tokens* (April 2021), https://www.gov.uk/hmrc-internal-manuals/cryptoassets-manual/crypto22600.

(signed) Sir Nicholas Green, Chairman
Professor Sarah Green
Professor Nicholas Hopkins
Professor Penney Lewis
Nicholas Paines QC

Phil Golding, Chief Executive

13 October 2021

Appendix 1: Terms of reference

The Law Commission is asked to conduct a twelve-month scoping study into the law around smart contracts.

The scoping study will:

(1) provide an analysis of the current law as it applies to smart contracts, including its conclusions on the UK Jurisdiction Taskforce's legal statement. The analysis of the law will highlight any uncertainties or gaps, with reference in particular to the questions listed in part A of the Annex, and the questions in part B where the Law Commission considers this to be appropriate; and

(2) identify areas in which further work or reform may be required, and provide such advice as the Law Commission considers appropriate on options for reform.

The Law Commission's work at this stage will not include related areas of law such as data protection.

Annex

Part A: key questions

The Law Commission will consider smart contracts under four principal headings:

(3) 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?

(b) Is a smart contract between anonymous or pseudo-anonymous parties capable of giving rise to binding legal obligations?

(c) In which circumstances will a statutory signature or "in writing" requirement be met in the context of smart contracts?

(d) How do the principles apply to a smart contract executed as a deed (which require additional legal requirements to be satisfied to be binding)? Would 'smart deeds' be valid and enforceable?

(e) Will the unilateral model of contract formation fit the situation in which strangers "accept" rights and obligations through interaction with a coded "offer"?

(4) Interpretation

(a) How would a court apply general principles of contractual interpretation to a smart contract written wholly or in part in computer code?

(b) Under what circumstances would a court look beyond the mere outcome of the running of a computer code that is or is part of a smart contract in determining the agreement between the parties?

(c) Should concepts such as “objective meaning of words” be revisited in the context of smart contracts composed of code?

(5) Performance of code as written v performance of contractual obligations

(a) How are errors in code to be treated? Should we differentiate between what the code was intended to perform and what it actually performs (bearing in mind code may behave in unintended ways)?

(b) Is the performance of the code as it is written fulfilment of the smart contract, even if the code does not execute as the developer (or one or all parties) intended?

(6) Remedies/Vitiation

(a) Where an agreement has been incorrectly recorded, which remedy or remedies provide the most appropriate alternative to rectification of the contract, when code recorded on most distributed ledgers will be immutable?

(b) In what circumstances will a smart contract be vitiated on the grounds of, for instance, mistake, frustration, duress or unconscionability?

(c) How will the law on misstatements apply to smart contracts?

(d) To what extent would or should remedies have to be provided “on chain”? Should the choice between various remedies be one made by the parties, left to the discretion of the court, set out in statutory form, or a combination of these?

Part B: possible additional questions for consideration

(1) Formation and security

(a) How do smart contracts and private keys relate to the standards for e-authentication and e-signatures set out in The Electronic Identification and Trust Services for Electronic Transactions (Amendment etc.) (EU Exit) Regulations 2019? (These are the post Brexit regulations for Regulation (EU) No 910/2014 – “eIDAS”.)

(b) Would providing standards for smart contracts in a similar way to eIDAS be beneficial?

(2) Other issues

(a) What factors will determine whether UK courts have jurisdiction, in the absence of a jurisdiction clause in the smart contract?

(b) Are there consumer protection issues for non-code literate parties who enter into smart contracts and should this be addressed by legislation?

Appendix 2: Acknowledgements

CALL FOR EVIDENCE

The following bodies and individuals responded to our call for evidence, which ran from 17 December 2020 to 31 March 2021.

Professional membership organisations

Chancery Bar Association

City of London Law Society

Commercial Bar Association

Digital Law Association

LawTech Sounding Board

Society of Licensed Conveyancers

STEP

The Law Society of England and Wales

Law Firms

Allen & Overy

Clifford Chance

DLA Piper UK

Eversheds Sutherland

Herbert Smith Freehills

Linklaters

Slaughter and May

Businesses

Berners Marketing Limited

D2 Legal Technology

Lloyd's of London

MBM Commercial

Trakti Ltd

Transpact

Vodafone

Individuals

Alfonso Delgado

Anurag Bana

Catherine Phillips

Charles Kerrigan

Cuneyt Eti

Florian Idelberger

Hendrik Puschmann

Katharine Graff

Luminita Procopie

Nicholas Bohm

Peter Howes

Stephan Smoktunowicz

Academics

Dr Benjamin Hayward, Monash University

Dr Drossos Stamboulakis, Monash University

Dr Lisa Spagnolo, Monash University

Dr Mateja Durovic, King's College London

Dr Robert Herian, The Open University

Dr Sara Hourani, Middlesex University London

Professor Christian Twigg-Flesner, University of Warwick

Professor Christopher Willett, University of Essex

Professor David Lowe, Aston University

Professor Hugh Beale, University of Warwick

Professor Kelvin FK Low, National University of Singapore

Other

P.R.I.M.E Finance Foundation

MEETINGS OR DISCUSSIONS

The Law Commission also met or corresponded with the following people and organisations in relation to this project.

Professional membership organisations

Chamber of Digital Commerce

International Swaps and Derivatives Association

The Law Society of England and Wales

TheCityUK

Government and public bodies

Bank of England

Department for Business, Energy and Industrial Strategy

Department for Digital, Culture, Media and Sport

HM Land Revenue

HM Revenue and Customs

Law Firms

Allen & Overy

Baker McKenzie

Bird & Bird

Clyde & Co

CMS

Fox Williams

Freshfields Bruckhaus Deringer

Gowling WLG

Herbert Smith Freehills

Linklaters

Mishcon de Reya

Norton Rose Fulbright

Reed Smith

Slaughter and May

Thrings

Womble Bond Dickinson

Businesses

Barclays Eagle Labs

Barclays plc

Clicktopurchase

ConsenSys

D2 Legal Technology

Franklin Templeton Investments

IBM

Innovative Integrations

Legg Mason

Mattereum

PricewaterhouseCoopers

R3

Rite-Choice Limited

Rosenblatt

TokenCard

Transpact

Zonafide

Individuals

Aaron Wright

Adam Sanitt

Clive Freedman

Graham Smith

Lord Holmes of Richmond MBE

Matthew Lavy

Nicholas Bohm

Nik Yeo

Peter Hunn

Rebecca Keating

Sir Geoffrey Vos

Stephen Mason

TJ Saw

Academics

Dave Michels

Dr Anna Donovan, University College London

Dr Eva Micheler, London School of Economics and Political Science

Dr Robert Herian, The Open University

Dr Stephen Murdoch, University College London

Dr Tatiana Cutts, London School of Economics and Political Science

Dr Theodora Christou, Queen Mary University of London

Associate Professor Philippa Ryan, ANU College of Law

Professor Adrian Briggs QC (Hon), University of Oxford

Professor Alex Mills, University College London

Professor Andrew Dickinson, University of Oxford

Professor Chris Reed, Queen Mary University of London

Professor Christian Twigg-Flesner, University of Warwick

Professor Christopher Clack, University College London

Professor Edwin Peel, University of Oxford

Professor George Danezis, University College London

Professor Hugh Beale, University of Warwick

Professor Ian Walden, Queen Mary University of London

Professor Jennifer Payne, University of Oxford

Professor Jonathan Harris QC (Hon), King's College London

Professor Louise Gullifer, University of Cambridge

Professor Ross Anderson, University of Cambridge

Other

Artificial Lawyer

British Standards Institution

City of London Corporation

European Bank for Reconstruction and Development

LawtechUK

Lexon.Tech

tScheme

Appendix 3: A non-exhaustive list of issues parties may wish to provide for in their smart legal contract

We set out below a non-exhaustive list of issues that parties may wish to consider (and possibly provide for) in their smart legal contract. This list is not exhaustive, but is intended merely to assist parties who wish to enter into smart legal contracts by drawing their attention to certain issues that may require upfront consideration, and possible treatment, in their contract. It is intended to provide parties with an insight into the sorts of issues that could lead to disputes if the parties have not properly provided for such matters in their contract. Dealing directly with these issues in express terms should reduce uncertainties regarding the legal treatment of the parties' smart legal contract, and reduce the scope for potential disputes.

(1) Before entering into a smart legal contract, parties should consider engaging in a rigorous planning phase to understand business requirements, and the objectives of the smart legal contract.

(2) Parties should give thought as to the form the smart legal contract will take, and whether the form will vary between individual obligations.

(3) Parties would be well advised to make clear the role of the code in their smart legal contract and, in particular, to specify if the code is intended both to define contractual obligations as well as to perform them, or only to perform them.

(4) Parties should consider the relationship between any natural language and coded terms. In particular, where the same term is expressed in both natural language and in code, parties would be well advised to make clear which term takes precedence in the event of a conflict.

(5) Smart legal contracts and associated technologies require parties to consider a broader range of factors before contracting than they would otherwise consider before concluding a traditional contract. Parties would be well advised to allocate risk in relation to, and to provide for (amongst other things):

  (a) a malfunctioning oracle or inaccurate data inputs;

  (b) external events beyond the parties' control which may affect performance of the code, such as system upgrades;

  (c) bugs and coding errors in the code; and

  (d) any potential mistakes that may arise due to the parties holding certain beliefs or assumptions about how the code will perform.

(6) Parties would be well advised to make clear the role of any non-executable comments in the code and, in particular, if such comments constitute contractual terms.

(7) Where the smart legal contract contains coded terms, parties would be well advised to provide a natural language explanation of the workings of the code, and to make clear that such explanation forms part of their contract. An understanding of the parties' intentions will be relevant in the event that the code performs in a way not expected by the parties.

(8) Parties who intend their transactions on a DLT system or other smart contract platform to create legal relations would be well advised to make this clear in natural language, either in a separate agreement or by way of comments in the code.

(9) Parties would be well advised to consider designing the coded element of their smart legal contract such that performance of the code can be terminated if necessary. Thought will have to be given as to how best to structure this functionality so as to avoid any associated risks of abuse by one of the parties. Similarly, to avoid a scenario where the code performs pending the outcome of a dispute, parties would be well advised to provide a mechanism for suspension of performance of the code in their smart legal contract.

(10) Parties would be well advised to include choice of court and choice of law clauses in their smart legal contract, either in a separate natural language agreement, or by way of comments in the code.