LIMITATIONS OF CODE IN CONTRACTS: WHAT WE CAN LEARN FROM THE PLAIN ENGLISH MOVEMENT

WILLIAM BROWN*

Smart contracts have been identified as a potential replacement for traditional written contracts, offering objective and predictable code as a substitute for complicated and impenetrable prose. The inherent complexity in contractual relationships, however, requires agreements to account for a range of often unpredictable circumstances. This complexity also prevented the widespread simplification of legal documents in the wake of the Plain English Movement.

I INTRODUCTION

In 1997, computer scientist Nick Szabo claimed that code-based protocols could be used to write computer software that resembled contractual clauses.[1] Szabo claimed these *smart contracts* would, 'give us new ways to formalise and secure digital relationships which are far more functional than their inanimate paper-based ancestors'.[2] Theoretically, smart contracts offer an alternative to traditional contracts which rely on objective and predictable code rather than subjective human decision making.[3] This article argues that the implementation of code-based smart contracts is limited and that there will not be a seismic shift in the way legal documents are drafted. This is because the viability of smart contracts will rely on the capacity for natural language clauses to be transposed into obligations in code. It is contended that the complete replacement of natural language obligations by code-based obligations is not possible due to the inherent complexities of contract law, the contracting environment, and the nature of the logic underpinning code. To demonstrate this, this article analyses the case of code with the case of the Plain English Movement ('PEM'), which attempts to simplify contracts through the incorporation of simple linguistic features and more readily understandable language.

For context, this article defines smart contracts in terms of their contemporary use, including an introductory explanation of common programming language and the benefits of its use. It is argued that the aims of both the PEM and smart contracts proponents are conceptually the same but that is it only the approaches which differ. As such, it is argued that smart contracts represent the next movement along the same continuum as the PEM. After establishing their conceptual similarities, the criticisms and limits of the PEM are applied to smart contracts, in order to demonstrate that as long as there are complex and multifaceted agreements made between two parties, the continued simplification of contracts will not be possible.

The ultimate conclusion of this analysis is that smart contracts can be incorporated as a way of improving contractual relationships in the same way that the changes proposed by the PEM have been implemented. It is likely that smart contracts will be integrated into the contracting framework alongside text as hybrid agreements, capitalising on the benefits of natural language and code.

II   Framework for Analysis

The basic framework underlying this article relies on an examination of the academic critique of the PEM and its relevance to the context of code-based contracts. To establish this framework it is necessary to outline the PEM, criticisms of it and how these criticisms are useful in assessing the place of smart contracts in contemporary legal practice.

A   *The Plain English Movement*

The PEM promotes the use of simple, concise English as the preferred method for legal writing. The seductive idea of allowing the law to speak 'directly to its subjects' represents the last definitive evolution in contractual drafting.[4] The philosophical origins of the PEM can be traced to the criticisms raised by luminaries such as Marx and Bentham, both of whom concur that the law is deliberately complicated in order to mystify its content.[5] At its core, the objective of the movement is to ensure that legislation and legal documents are concise and widely accessible. This, it is contended by PEM proponents, leads to the demystification of the law and a greater sense of engagement.[6] As Arthur Symonds observed, drafters of statutes and legal documents

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4   Edwin Tanner, 'The Comprehensibility of Legal Language: Is Plain English the Solution?' (2000) 9 *Griffith Law Review* 52.

5   HLA Hart, *Essays on Bentham: Study in Jurisprudence and Political Theory* (Oxford, 1982) 21.

6   Rabeea Assy, 'Can the Law Speak Directly to its Subjects? The Limitation of Plain Language' (2011) 38(3) *Journal of Law and Society* 376, 378.

'seldom succeed in giving to the people a law intelligible either to themselves or the persons for whose special guidance the law was designed'.[7] Beginning with demands to improve the intelligibility of government document and legislation, advocates eventually lobbied for commercial agreements to be drafted in more accessible language.[8]

In Australia, for example, the *Legal Profession Uniform Law* requires conditional costs agreements 'to be in writing and in plain language'.[9] The *National Consumer Credit Regulations* also require that information relating to fees and charges 'must be set out in a way that is easy for the consumer to understand without being required to do any working out or to look elsewhere for additional information'.[10] Perhaps the most concerted effort to legal language is the four-yearly reviews of modern awards undertaken by the Fair Work Commission in order to ensure the modern award system is simple, easy to understand, stable and sustainable.[11] The Full Bench of the Commission explained that its draft guidelines were developed by an external plain language expert in order to 'remove ambiguity, promote certainty and make awards simpler and easier to understand'.[12]

These examples reflect the trend to avoid archaic language, simplify grammatical structures, shorten sentences and adopt a more organised form.[13] Ultimately, these changes are pursued to ensure that material can be discerned by non-lawyers and to minimise the risk of future disputation by providing clarity about the rights and responsibilities of those whose conduct is governed by legal documents.[14] Justice Michael Kirby, writing extracurially, noted that the incorporation of plain language, including the features outlined above, serve to improve the clarity of legal documents.[15] Justice Kirby argued that what is at stake 'is not just the theoretical goal of improving the understanding of law' but rather, 'the noble objective of making the law speak with a clearer voice to the people who are bound by the law'.[16]

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7   Peter Butt and Richard Castle, *Modern Legal Drafting: A Guide to Using Clearer Language* (Cambridge University Press, 2001) 59.

8   Ibid 91.

9   *Legal Profession Uniform Law 2014* (NSW) s 181.

10   *National Consumer Credit Protection Regulations 2010* (Cth) s 28E(5).

11   *4 Yearly Review of Modern Awards—Pharmacy Industry Award 2010* [2017] FWCFB 344, [20] ('*FW Review*').

12   Ibid [20].

13   Joseph Kimble, 'Plain English: A Charter for Clear Writing' (1992) 9 *Thomas M Cooley Law Review* 1, 8.

14   *FW Review* (n 11) [20].

15   Justice Michael Kirby, 'Ten Commandments for Plain Language in Law' (2010) 33 *Australian Bar Review* 10, 10.

16   Ibid.

Noble as the objective may be, contract law is a complex and vastly documented subject. As Richard Wincor aptly quipped 'only a lawyer can deal with it on a serious level, and only a monk can know all of the published literature that expounds it'.[17]

B   *Limitations of Plain Language*

While the motivations of the PEM are commendable, complex commercial agreements continue to exist for several reasons. These reasons suggest that there is a need for brevity in the drafting agreements which is overlooked by proponents of the PEM. If agreements are to effectively organise social and economic activities in a meaningful way, clarity will inevitably be compromised. As Nazareth notes 'to enter into a contract, to transfer ownership of property, and the like, legal texts have to be detailed and lengthy'.[18] This is because the context of contractual obligations is essential to understanding their effect, as it is the context and the interplay between obligations themselves which give agreements, and laws more generally, their meaning.[19] As such, the more complex the legal relationship between parties, the more intricate the structure of an agreement is likely to be. The more complex the structure, the more complex the balancing exercise becomes with respect to the relevant principles and rules.

Refraining from the use of archaic phrasing and convoluted clause structuring has not reduced the need for legal services, lawyers, or the complex agreements they continue to draft. This is because the intersection and relationship between certain rules require considerable familiarity. The volume and complexity wrapped up in the subject matter means that any attempt to represent legal obligations on paper is fraught with complications. For a person to develop a legal agreement relevant to their particular circumstances, an individual needs to understand the role of precedent and analogise with previous borderline cases. These issues are so prevalent that they cannot be bypassed by the act of breaking down the law into short, elegant clauses which are free of technical terms and presented in a user-friendly way.[20]

This issue is demonstrated in an empirical study by Tanner,[21] who compared the intelligibility of a bank guarantee, described by Higgins J as 'incomprehensible legal

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17   Richard Wincor, *Contracts in Plain English* (McGraw-Hill, 1976) 1.

18   CBE Nazareth, 'Legislative Drafting: Could our Statutes be Simpler' (1987) 8 *Statute Law Review* 81, 89.

19   Timothy Endicott, 'Law and Language' (2002) in J Coleman and S Shapiro (eds), *The Oxford Handbook of Jurisprudence and Philosophy of Law* (Oxford University Press, 2002) 946–8.

20   James Penner, 'Legal Reasoning' in J Penner, D Schiff and R Nobles (eds), *Introduction to Jurisprudence and Legal Theory* (Butterworths, 2002) 649.

21   Edwin Tanner, 'The Comprehensibility of Legal Language: Is Plain English the Solution?' (2000) 9 *Griffith Law Review* 52, 52–3.

gobbledygook',[22] with two plain English versions of the guarantee. One passage was prepared by the bank itself and one was prepared by a researcher. The participants in the study were law students, whose comprehension of the materials was tested with multiple-choice questions with simple answers based on the order of information in the extract.[23] The respective rates of comprehension were:

- 52.6% – original text;
- 62.4% – redraft by the bank; and
- 68.6% – redraft by the researcher.

While there was an improvement of 16%, one-third of the text was indecipherable by individuals with some legal training.[24] This experiment demonstrates that the simplified expression of complex ideas does not simplify the concepts themselves.

C   *Limits of Precision*

Analysis of the simplification of legal drafting leads to a divergence between two types of clarity: linguistic clarity and legal clarity. While the two concepts are not mutually exclusive, the need for legal clarity will always prevail in contracting. This is because the sorts of situations that require contracts will be sufficiently complex that the contract itself must anticipate a wide variety of behaviour and contingencies.

HLA Hart notes that the scope of contractual rules is dynamic as 'they evolve by being adapted, adjusted, restricted, qualified or otherwise'.[25] Hart's point illustrates the nature of legal documents is less about the nature and structure of words and more about the organisation of ideas and rules. This is a task which requires brevity and which is beyond the 'limit … inherent in the nature of language, to the guidance which general language can provide'.[26]

In the context of the Hart-Fuller debate, it was observed by Schauer that words themselves may never have a clear meaning and cannot be relied upon in and of themselves.[27] This line of scholarship and empirical evidence suggests that there is a limit to the simplification of contracts. While the tension between linguistic and legal clarity indicates that contracts cannot be simplified at the expense of brevity, there is

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22   *Houlahan and Houlahan v Australian and New Zealand Banking Group Limite*d [1992] ACTSC 103, [27] (Higgins J).
23   Tanner (n 21) 59.
24   Ibid.
25   HLA Hart, *The Concept of Law* (Oxford, 1994) 128.
26   Ibid 126.
27   Frederick Schauer, *Thinking Like a Lawyer* (Harvard University Press, 2009) 151–8.

merit in the pursuit of simplification where practicable. A simpler and accessible law language may ensure that lawyers can provide a more effective service and some information asymmetries between parties can be remedied.

D   *Modern Movement to Simplify: Smart Contracts*

The similarity between the PEM and the modern movement to incorporate smart contracts into common use is that they are both in pursuit of the same goal. That is, to simplify legal documents, particularly contracts, which have been described as a 'flood of darkness and confusion'.[28] As discussed below, smart contracts are designed to simplify the execution and enforcement of legal agreements through the use of programming language. At its crux, the transposing of legal agreements into code represents the next development in the pursuit of simplification. The difference is that the simplification of linguistic features is being superseded by the use of code. This article argues that both the PEM and smart contract movements are befallen to the same issues of complexity. Moreover, it is contended that the implementation of smart contracts will serve only to improve on traditional contracts rather than facilitate a radical change in contracting. In the same way that the use of plain English has improved how complexity is managed in contracting, smart contract functionality will operate as an efficiency tool in the form of hybrid agreements.

III   INTRODUCTION TO SMART CONTRACTS

The first definition for a code-based smart contract was provided by Nick Szabo, a computer scientist credited with pioneering much of the early research on digital currencies. Specifically, Szabo described a smart contract as a 'set of promises specified in digital form, including protocols which the parties perform on those promises'.[29] Following increased interest in the application of smart contracts, particularly during the rise of crypto-currencies, this definition has been revised. Smart contracts are now considered to be computer code that 'automatically executes all or parts of an agreement and is stored on a blockchain-based platform'.[30] The agreement governing the relationship between Party A and Party B may be the

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28   *DeLancy v Insurance Co*, 52 NH 581 (Doe J) (1873).

29   Nick Szabo, *Smart Contracts: Building Blocks for Digital Markets* (1996) <http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_2.html>.

30   Stuart D Levi and Alex B Lipton, 'An Introduction to Smart Contracts and Their Potential and Inherent Limitations', *Harvard Law School Forum on Corporate Governance and Financial Regulation* (Web Page, 26 May 2018) <https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/>.

only representation of the contractual relationship, or it may exist in addition to a traditional, text-based contract to execute certain provisions such as payment. The point of difference between smart contracts and traditional agreements is that smart contracts are capable of enforcing obligations autonomously with code. This process involves the memorialisation of obligations in a formal programming language, such as Ethereum's Solidity.[31] If the parties meet the parameters of the agreement, the code will execute the relevant step triggered by the parameters. For example, an insurance company, AXA, implemented a parametric insurance product called *fizzy* which was designed to compensate customers for delayed flights.[32] The insurance premium was determined by analysing historical flight and frequently updated flight data to calculate the risk of delay.[33] Policyholders whose flights were cancelled or landed with at least a two-hour delay were compensated automatically without the need to file a claim or submit paperwork of any kind.[34]

As AXA demonstrated, smart contracts have the potential to leverage efficiency, impartiality and security of contractual agreements, ultimately leading to reduced costs and increased trust between parties.[35] To gain a greater understanding of how these potential benefits can be leveraged, companies have piloted a variety of other commercial arrangements underpinned by smart contracts. For example, Commonwealth Bank of Australia partnered with Wells Fargo and Brighann Cotton to undertake 'the first global trade transaction between two independent banks'.[36] The open account transaction involved a shipment of cotton from Texas in the United States to Qingdao in China, where the agreement mirrored a letter of credit executed through a private distributed ledger.[37] The distributed ledger hosted a collaborative workflow between Brighann Cotton (US-based seller) and Brighann Cotton Marketing (Australian-based buyer) alongside their respective banks. By relying on geographical triggers, payments were released in accordance with the location of the goods in transit. This mechanism provided greater protection from

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31   Ferreira et al, 'Blockchain: A Tale of Two Applications' (2018) 8(9) *Applied Sciences* 16; Vitalik Buterin, 'Ethereum White Paper: A Next Generation Smart Contract and Decentralized Application Platform' (2015).

32   AXA, *AXA Goes Blockchain with Fizzy* (Web Page, 13 September 2017) <https://www.axa.com/en/magazine/axa-goes-blockchain-with-fizzy>.

33   Andre Clemente, 'fizzy by AXA: Ethereum Smart Contract in details', *Medium* (Web Page, May 2019) <https://medium.com/@humanGamepad/fizzy-by-axa-ethereum-smart-contract-in-details-40e140a9c1c0>.

34   Ibid.

35   Florian Idelberger et al, 'Evaluation of Logic-Based Smart Contracts for Blockchain Systems' in Jose Julio Alferes et al (eds) *Rule Technologies: Research, Tools, and Applications* (Springer, 2016).

36   Commonwealth Bank of Australia, 'Commonwealth Bank, Wells Fargo, and Brighann Cotton Pioneer Landmark Blockchain Transaction' (Media Release, 24 October 2016) <https://www.commbank.com.au/guidance/newsroom/CBA-Wells-Fargo-blockchain-experiment-201610.html>.

37   Ibid.

premature payment or withholding of payment. Ultimately, this mechanism provided greater certainty of payment to both parties whilst minimising the need to enforce payment after the fact. It could be argued that the combination of these benefits creates an environment where this is no need for intermediaries such as lawyers, courts, and banks. While smart contracts may be elegant, clear and simple it does not mean that they are a legally or commercially viable alternative to traditional natural language contracts.

IV   Code and Complexity

The process of simplifying complex processes into code was first devised by George Boole and the processes he developed in the 19th century underpin the basics of most modern computers and computer programming.[38] Smart contracts themselves are usually programmed in a procedural language, which is interpreted based on Boolean logic that reduces all values to either *true* or *false*.[39] When programming in a procedural language, the programmer writes an explicit sequence of steps, wherein the programming must outline what is to be done and how to achieve it.[40] In its most basic form, this proposition would state, if *x* occurs, then execute step *y*. This basic, binary logic most frequently facilitates the movement of cryptocurrency from one account to another upon completion of some form of obligation, such as payment. As with other forms of software, this form of program allows for clarity, modularity and precision.[41] This logic has long been recognised as a means of decreasing ambiguity by turning mere promises into technical rules.[42]

The promotion of technical language can be seen as a useful foil for drafting errors and inconsistent language in complex and lengthy agreements, of which many are drafted under time pressure. To those who perceive smart contracts as the cure to poor drafting, it is always possible to draft complete and unambiguous agreements and a failure to do so embodies the failings or incompetency of the lawyer responsible.[43] Ambiguity, however, is a feature which is essential in the context of contracting to allow for the interpretation of contractual terms flexibly. This means

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38   Alexander Savelyev, 'Smart Contracts as the Beginning of the End of Classic Contract law' (2017) 26(2) *Information and Communications Technology Law* 116, 125.

39   Ibid.

40   Mik, 'Smart Contracts: a Requiem' (n 3) 71.

41   Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press, 2018) 81.

42   P Carl Mullan, *The Digital Currency Challenge: Shaping Online Payment Systems through US Financial Regulations* (Palgrave Macmillan, 2014) 84–92.

43   Eliza Mik, 'Smart Contracts: Terminology, Technical Limitations and Real World Complexity' (2017) 9(2) *Law, Innovation and Technology* 269, 288.

that transposing contracts into code is made difficult by the fact that agreements have been written in natural language that has evolved to reflect and regulate the complexity of human behaviour. As such, obligations and contractual terms cannot easily be transposed into the binary, technical language of code.[44] Well-constructed legal agreements are designed, like pieces of legislation, to account for a variety of contingencies which cannot always be seen at the time of drafting. By drafting contractual obligations in a broad and open-ended manner, they can be applied in a variety of contexts without requiring additional amendment or supplementary agreements.[45] Natural language provides greater uncertainty, which, although it can be characterised as a shortcoming, provides a level of flexibility which allows agreements to be interpreted on a case-by-case basis. This allows judges or arbitrators room to reinterpret the law if it appears that on the facts of a case, the agreement's blind application would violate the agreement's initial intent.

Substituting such natural language clauses into code could permit distortions of their meaning and make them less adaptable to unforeseen circumstances. Because smart contracts rely wholly on this sort of programming language, they cannot be drafted in a way which facilitates open-ended legal interpretation. As the above example demonstrates, this is because the code can only be applied to a set of objectively verifiable rules, defined in code.[46] This premise limits the application of code before the emergence of more advanced programming and artificial intelligence capabilities that can adapt to unforeseen situations.[47] Further, the inability to account for every contingency in addition to the formal and binary language allows people to game the system, as explored in the decentralised autonomous organisation ('DAO') case study below. This is because the language used is one-dimensional and can be bypassed if the code is not precise enough or is too broad. By simply looking at the simple *if-then* proposition memorialised in code, it would be possible to work out exactly what to do to trigger or not to trigger the defined terms of the agreement.

A   *Case Study: The DAO Attack*

The collapse of the crowd-funding platform, the DAO, provides a useful illustration of the issues set out above. The DAO was a contract implementing a crowdfunding platform which initially raised USD 150 million before it was attacked on during

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44   Alan Watson, *Sources of Law, Legal Change, and Ambiguity* (University of Pennsylvania Press, 1998).
45   Ronald Dworkin, 'Law as Interpretation' (1982) 9(1) *Critical Inquiry* 179.
46   De Filipi and Wright (n 41) 200.
47   Jay Kesan and Rajiv Shah, 'Setting Software Defaults: Perspectives from Law, Computer Science and Behavioral Economics' (2006) 82 *Notre Dame Law Review* 583, 590.

mid-June 2016.[48] The hacker managed to control USD 60 million until the blockchain was able to nullify the transactions in question.[49] By exploiting a fallback in the coding, the hacker was able to request the smart contract to give the ether back multiple times before the smart contract could update its balance. By exploiting this recursive call, the hacker was merely executing the existing code.[50] In the wake of the attack, two main issues were identified that enabled the money to be redirected. First, the coders did not anticipate the possibility of a recursive call. Second, the coders did not account for the need to update the internal token balance to coincide with the immediate transfer of the funds.[51] By opting to encode the contractual rules into code, the DAO was unable to reflect the actual intentions of the contracting parties.[52] In the wake of the attack itself, there was disagreement within the Ethereum community between those wishing to intervene and reverse the transaction, and those who wanted to abide by the strict formulation of the code itself and refrain from intervening.[53]

Put simply, this was a standoff between those who wanted the intention of the code to prevail over wording of the code, reflecting the common contractual dispute between strict and broad interpretations.[54] Despite the evident failings of code in this situation, many who formed the view that an intervention should not be pursued on the basis that it would set a dangerous precedent.[55] The Ethereum Foundation suggested that intervention would erode the very social contract they had set up with its network of independent nodes.

If one was to project these facts onto a traditional contractual framework, a judge would be able to use the flexibility and brevity built into the contract to ensure that a blind application of the rules would not yield a result contrary to the parties' intentions. While the DAO example demonstrates the need for brevity with respect to

48   Giulio Prisco, 'The Dao Raises More Than $117 Million in World's Largest Crowdfunding to Date', *Bitcoin Magazine* (online at 16 May 2016) <https://bitcoinmagazine.com/articles/the-dao-raises-more-than-million-in-world-s-largest-crowdfunding-to-date-1463422191/>.

49   Gaye Middleton, 'The Weakest Link on the Blockchain — Smart Contracts and the DAO Attack' (2016) 19(8) *Internet Law Bulletin* 402, 402.

50   Richard Price, 'Digital Currency Ethereum Is Cratering Because of a $50 Million Hack', *Business Insider* (online at 16 June 2016) <www.businessinsider.com/dao -hacked-ethereum-crashing-in -value-tens-of-millions-allegedly -stolen-2016-6>.

51   Samuel Falkon, 'The Story of Dao - Its History and Consequences', *Medium* (Web Page, 24 December 2017) <https://medium.com/swlh/the-story-of-the-dao-its-history-and-consequences-71e6a8a551ee>.

52   Primavera De Filippi, 'A $50M Hack Tests the Values of Communities Run by Code', *Vice Motherboard* (Web Page, 11 July 2016) <https://www.vice.com/en_us/article/qkjz4x/thedao>.

53   Ibid.

54   Ibid.

55   David Siegel, 'Understanding the DAO Attack', *Coindesk* (Web Page, 27 June 2016) <https://www.coindesk.com/understanding-dao-hack-journalists>.

intention, which cannot be replicated in code, there are two further key features of contracts which cannot easily be replicated in code – the concept of good faith as well as representations and warranties.

B   *Good Faith*

Good faith is a principle of interpretation that embodies a multitude of standards[56] and is expressed with greater or lesser specificity in reference to a particular contextual focus.[57] While the actual standard of good faith may differ depending on the context there will always be a common thread. That is, that there will be a minimal standard of reasonableness. This is not an objective rule, rather it is one of fairness, established by reference to the broader community interest in fair treatment.[58] Given the inherent complexity of good faith, it can be difficult to define what constitutes appropriate performance. For instance, while a party may agree to use their best effort to fulfil their obligations, the most effective way of doing so is not clear at the outset. To account for this uncertainty, traditional contracts are drafted in such a way which that they are open-ended and ambiguous. This is the sort of vagueness which has attracted the ire of both PEM and smart contract proponents, however, it is necessary and even efficient in the context of contracting.[59]

C   *Representations and Warranties*

In addition to good faith, standard legal agreements also include representations and warranties which cannot be programmed by reference solely to data stored or managed on a blockchain-based network. In the case of warranties, complexity is an issue insofar as the test for determining what is a warranty and not a condition of the agreement is defined in relation to the 'general nature of the contract'.[60] This line drawing problem is inherently complex and the impact on the interpretation of the contract is considerable, because the determination of what constitutes a condition

> goes to the heart of the matter, so that a failure to perform it would render the performance of the rest of the contract a thing different in substance from what [is] stipulated for'.[61]

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56   Anthony Mason, 'Contract, Good Faith and Equitable Standards in Fair Dealing' (2000)
      116 *Law Quarterly Review* 66, 69.
57   *Codelfa Construction Pty Ltd v State Rail Authority of New South Wales* (1982) 149 CLR 337.
58   Suzanne Corcoran, 'Good Faith as a Principle of Interpretation: What Is the Positive Content of
      Good Faith?' (2012) 36 *Australian Bar Review* 1, 8.
59   See generally George Triantis, 'The Efficiency of Vague Contract Terms: A Response to the Schwartz-Scott
      Theory of U.C.C Article 2' (2002) 62 *Louisiana Law Review* 1065.
60   *Tramways Advertising Pty Ltd v Luna Park (NSW)* (1938) 38 SR (NSW) 632, 641–2 (Jordan CJ).
61   *Bettini v Gye* (1876) 1 QBD 183, 188 (Blackburn J).

Further, contracting parties will also assign ownership interests, confidentiality, and compliance with particular laws. These open-ended obligations are neither highly formulaic nor sufficiently binary to be replicated in code for the foreseeable future.

D   *Limits Imposed by Complexity*

In commercial practice, these issues were neatly illustrated in the implementation of Hogan Lovells' earthquake insurance smart contract.[62] The proof of concept included a digital term sheet to govern the relevant pay-outs and was modelled as an Ethereum-based smart contract. Following initial trials, the firm identified key differences between the code agreement and a comparable traditional agreement.[63] One of the problems identified by the firm in its vulnerabilities memo was that the smart contract was unable to account for aftershocks. This led the firm to observe that 'programmers think in terms of bits and bytes, while the contracting parties have been doing these types of agreements for years', and to bridge the gap between traditional and smart contracts, lawyers' involvement will be essential.[64]

This example, along with the analysis outlined above, illustrates the ongoing need for standard legal agreements to account for a range of unknown factors at the inception of the agreement. Traditional legal agreements continue to be the primary form of contracting because their brevity ensures that contractual relationships are clearly defined and that unforeseen circumstances can be catered for. Because of the complexity of the contractual landscape the notion that complex commercial agreements can be obviated by simplified linguistic features or code is unrealistic. What can be said, however, is that both plain English drafting and code can be used to ensure that the primary agreement can function more effectively.

V   HYBRID AGREEMENTS

In light of the limitations imposed by complexity, it is possible to predict how smart contracts will alter the landscape of commercial agreements. In this context, the PEM provides a useful precedent for how the contracting process can be improved. Ultimately, despite its limitations, the PEM has led to contracts being drafted in such a way that the inherent complexities, such as unforeseen circumstances, can be

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62   Steven Norton 'Law Firm Hogan Lovells Learns to Grapple with Blockchain Contracts', *Wall Street Journal* (Blog Post, 1 February 2017) <https://blogs.wsj.com/cio/2017/02/01/law-firm-hogan-lovells-learns-to-grapple-with-blockchain-contracts>.

63   Ibid.

64   Ibid.

effectively managed by while ensuring the language is clearly expressed and can be understood by a non-legal audience. The most likely way in which smart contracts will also improve commercial drafting is in the form of hybrid or split agreements. There is no firm definition of such an agreement, although it is the subject of considerable embryonic research.[65] This research suggests that there are two divergent pathways for development. First, a model whereby human decision making will be permitted at certain critical junctures by code. Second, a model based on electronic data interchange ('EDI') agreements, wherein a natural language master agreement exists and is supplemented by the use of code. In this article, they are referred to as code-based and text-based models.

A   *Code-Based Model*

This model would consist of the digital portion of the contract supplemented by a pre-programmed safety switch which would allow for humans to intervene where necessary.[66] While the digital and analogue components of the contract would appear to operate side-by-side, the majority of the contract including all key components would be memorialised in code. To rely on human intervention under an analogue process, a predetermined event would need to occur. In the context of the examples outlined above, this could happen in the event of an aftershock or the application of good faith. The difficulty with code-based models is that they are subject to the same issues of complexity as smart contracts. This is because programming for human intervention would require an exclusive definition of a particular event, which as this article has argued, is complex and perhaps unachievable.

B   *Text-Based Model*

Text-based models would likely be similar to EDI agreements, whereby parties choose not to rely wholly on code. Instead, parties execute a master agreement which outlines the use of code in the context of the contractual relationship.[67] This approach would allow for the traditional language components of the agreement to account for complexity while simultaneously allowing code to be utilised to quickly and efficiently execute simple and non-complex elements of the contractual relationship.

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65   Scott Farrell et al, 'How to Use Humans to Make "Smart Contracts" Truly Smart', *King and Wood Mallesons* (Web Page, 7 July 2016) <www.kwm.com/en/knowledge/ insights/smart-contracts-open-source-model-dna-digital-analogue-human-20160630>.

66   Anurag Bana and Maxine Viertmann, *The Not-So Distant Future: Blockchain and the Legal Profession* (Report, February 2017) <https://www.ibanet.org/Document/Default.aspx?DocumentUid=92F2723C-DF49-41E7-9E76-224CD67331DB>.

67   Robert Wittie and Jane Winn, 'Electronic Records and Signatures under the Federal E-SIGN Legislation and the UETA' (2000) 56 *Business Lawyer* 293, 294.

The issue with hybrid agreements is that the job of determining what elements of the relationship are to be code-based may be complicated and parties may have divergent views.

C   *Operational and Non-Operational Clauses*

To effectively identify the elements of a hybrid agreement that can or cannot be replicated in code, it is necessary to understand the distinction between non-operational and operational clauses. Non-operational clauses are those which relate to the wider relationship between legal parties, including clauses that define which law should govern in the event of a dispute, what is meant by in good faith and reasonableness, and that all transactions entered into under a master agreement form a single agreement. Operational clauses are those that relate to a deterministic action following the occurrence of a specified event or at a specified time, for example, clauses requiring an amount to be payable on a payment date equal to the product of a calculation, that one party to the contract pays the other an amount equal to the difference between the settlement price and a forward price, or that a party transfer assets on a particular date.

The key difference between the two types of clauses is that non-operational clauses are not fixed and are therefore less susceptible to being expressed in pure Boolean logic. Conversely, operational clauses can be expressed readily in Boolean logic and can be represented in code more easily. For example, the standard contractual representation that a party is duly organised and registered under a particular jurisdiction is not a statement of conditional logic and therefore could not be transposed into a programming logic based on Boolean logic. Again, this reinforces that the process of simplification of contracts into code or plain English will crash against the bulwark of complexity.

D   *Settling on a Model*

The benefit of the hybrid model is that the blend of text and code will allow for contracts to work more efficiently and ensure that simple components of the contract can be executed seamlessly. Complexity remains a key feature in determining which model ought to be incorporated. The interaction between off-blockchain and on-blockchain features of a hybrid model will require a high level of technical execution by both programmers and lawyers. Given that contracting parties will continue to pursue certainty and brevity in their contractual arrangements, it is very likely the text-based model of hybrid agreements will prevail. This conclusion is aided by the fact that a clause relating to the relationship between the master agreement

and other auxiliary agreements is non-operational in nature. This view is consistent with the limited number of applications initially envisaged for smart contracts, such as the trading of financial instruments.[68] It is important to note that the ambitious narrative of the application of smart contracts emerged alongside the explosion of interest in cryptocurrencies and many of the initial assertions are now being scrutinised by technology and legal academics.[69] The view that all contractual provisions can be simplified into an algorithmic and finite form replicable in code represents a misunderstanding of contract law and the purpose of contracts. It must be conceded, however, that developers are right to view certain contractual conditions as simple enough to be reduced to an algorithm replicable in code. For example, provisions operational in nature can be prescribed by simple sequences of actions, such as *deliver [object] to [place] on [date]*.[70] Based on this analysis it would appear that the text-based model is the most effective way of accounting for complexity while harnessing the simplification of operational clauses in code. It follows that if one was to establish a hybrid agreement in code, the inability to broadly define the non-operational relationship between the code and text components would render it ineffective.

VI CONCLUSION

To predict how smart contracts will redefine the contractual landscape, it is essential to examine the purpose of contracts, their evolution, and the technological limits of code itself. Both the PEM and smart contract movement aim to simplify how commercial agreements are drafted and effectively minimise ambiguity by incorporating strict rules and binary logic. The method for achieving this is conceptually the only distinction. As such, simplified contracts and code-based contracts aim to reduce ambiguity and maximise intelligibility. Proponents of the PEM, who claim contracts can be wholly simplified, and proponents of smart contracts, who claim that they can be replicated entirely in code, both overlook that contracts are not supposed to be simplistic. Brevity and ambiguity are necessary to ensure that contracts can be read in light of a multitude of unforeseen circumstances and in light of the complex jurisprudence which has developed around contracts. Further, while advances in programming will ensue, the logical basis upon which they are built is unlikely to change substantially. This means that smart contracts will always be

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68   Mik, 'Smart Contracts: Terminology, Technical Limitations and Real World Complexity' (n 43) 289.
69   Mik, 'Smart Contracts: a Requiem' (n 3) 70.
70   ISDA & Linklaters, *Whitepaper: Smart Contracts and Distributed Ledger – A Legal Perspective* (August 2017).

deterministic, rigid and unable to account for complexity. Despite this conclusion, it is important to acknowledge the benefits of incorporating code in the contractual landscape. Code offers contracting parties an efficient way to simplify the execution of operational clauses which are capable of being simplified following Boolean logic. The same cannot be said for non-operational obligations relating to conceptually broad notions such as 'good faith', 'reasonableness', or in the interplay relating to representations and warranties. These benefits will build on the important results of the PEM, ensuring that the documents which govern the way we interact on a commercial and social level will be improved.

It will be important for legal practitioners and developers to come to grips with this reality and familiarise themselves with the similarities and differences in their respective approaches. If hybrid agreements are to be drafted effectively, programmers will need to understand the limits imposed by complexity and lawyers will need to embrace code's ability to ensure perfect performance and lower transactions costs caused by unnecessary intermediaries.