Techno-Legal Supertoys: Smart Contracts and the Fetishization of Legal Certainty

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Chapter 11:
Techno-Legal Supertoys: Smart Contracts and the Fetishization of Legal Certainty
Robert Herian

1. Introduction

Life, some say, imitates art. Nowhere is this better illustrated than in realities, including legal realities, that uncannily reflect the imaginings of science fiction. In the following dialogue from Steven Spielberg’s 2001 film *AI: Artificial Intelligence* is the description of an agreement between two boys, one a machine (David) the other human (Martin):

Martin: “If you do something really, really, really special for me - a special mission - then I’ll go tell mommy I love you, and then she’ll love you to”.

David: “What shall I do?”

Martin: “You’ll have to promise, and then I’ll tell you”.

David: “You’ll have to tell me, and then I’ll promise”.

Martin: “I want a lock of mommy’s hair; I’ll share it with you…”

David: “We can ask her”.

Martin: “No, it has to be a secret mission. Sneak into mommy’s bedroom in the middle of the night and chop it off”.

David: “I can’t Martin, I’m not allowed”.

Martin: “You promised. You said: tell me and then I’ll promise, didn’t you?”

As children, one might expect the negotiation, and eventual agreement, between David and Martin to be naïve and stripped of any appreciation for broader, long-term consequences. David and Martin view their

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1 *AI: Artificial Intelligence*, Directed by Steven Spielberg (Warner Brothers, 2001). Spielberg’s film is based on the short story collection, Brian Aldiss, *Supertoys Last All Summer Long: And Other Stories of Future Time* (Orbit, 2001)
agreement as one made in a moment, and, whilst executable in time, that time is the immediate future, the coming night.

Also, David and Martin’s agreement is absolute and inviolable, with what little negotiation the boys have on individual terms resulting in an agreement of unbreakable promises. It does not matter which way either party approaches the substance or content of the agreement, the promise is always already part of the outcome, an idea elegantly showed by the exchange. Martin says: “You’ll have to promise, and then I’ll tell you”. David says: “You’ll have to tell me, and then I’ll promise”. This ideal of fair play, whilst portrayed here by children and arguably redolent of any childlike idealism concerning promises as yet corrupted by the moral hazards and cynicism of social and political life, is recognisable in the utopian worlds of modern technologists who are keen to show they can correct real-world (that is, human) failures in trust, honesty, and accountability with code, protocols, and distributed networks.

Drawing on Anglo-American and European legal theory, doctrines and principles (reflecting the trans-jurisdictional presence and influence of technological systems and networks), this chapter describes how the agreement formation and execution showed in AI is recognisable in “real-world” electronic agreements known as “smart contracts”, one piece of the larger and expanding jigsaw of distributed and disintermediated technologies built on and around a variety of distributed ledgers and blockchains.²

Smart contracts fall into two broad categories that reflect depths of legal character and complicate orderly definitions. First are disclaimers of the functional legality of smart contracts in favour of a status as programming conventions, and second are a spectrum of definitions

² This article will not define nor discuss blockchain technology explicitly. But it is important to note that blockchains have long been associated with the notion that counterparties to a transaction or agreement do not need to trust one another. This is because a blockchain checks and verifies transactions or agreements independent of the parties to them. This status afforded by blockchain can be called post-trust. See, for example, Robert Herian, Regulating Blockchain: Critical Perspectives in Law and Technology (Routledge 2018), 128
that take the legality of smart contracts seriously. An example of the former is: "Although the word ‘contract’ is used in the DAO’s framework code, the term is a programming convention and is not being used as a legal term of art. The term is a programming convention, not a representation that the code is in and of itself a legally binding and enforceable contract".\(^3\) Ethereum founder Vitalik Buterin, speaking in 2016, maintained that, “a smart contract is a computer programme that directly controls some digital asset”, a definition that recalls the causality of algorithms (“if x, then y”).\(^4\) Yet, it is a causality unfamiliar to traditions of contract (and property) law and theory, in which the heterogeneity of inter-party negotiations forms the backdrop to contractual processes.\(^5\) Further, some definitions of smart contracts eschew any explicit legal framework at all, for example: “A piece of EVM [Ethereum Virtual Machine] Code that may be associated with an Account or an Autonomous Object”, foregrounding the question of why legal status ought to be attributed to them at all.\(^6\)


\(^5\) A case in point is incomplete contracts. Complete contracts are “contracts where everything that can ever happen is written into the contract. There may be some incentive constraints arising from moral hazard or asymmetric information but there are no unanticipated contingencies. Actual contracts are not like this, as lawyers have realized for a long time. They are poorly worded, ambiguous, and leave out important things. They are incomplete”: Oliver Hart, Incomplete Contracts and Control. (Nobel Prize Lecture, 8 December 2016), 372-373, URL: https://www.nobelprize.org/uploads/2018/06/hart-lecture.pdf (last accessed 9 July 2021). See also, Robert E. Scott and George G. Triantis, Anticipating Litigation in Contract Design. Yale Law Journal. Vol. 115, Issue 4 (January) (2006) 814-879.

The second category of definitions is the product of the principle that disclaimers and non-legal definitions do not dispel the fact that, as instruments of promise and agreement, some “smart contracts” may well produce legal effects. As Sir Geoffrey Vos maintains: “Smart contracts may be taken to be enforceable legal agreements expressed to a greater or lesser extent in computer code”.7 Hence, we find a spectrum of definitions that take the legality of smart contracts seriously. For example, as described in recent blockchain legislation in the Illinois General Assembly: “a contract stored as an electronic record which is verified by the use of a blockchain”.8 At first blush, the wording of the Illinois legislation suggests that a smart contract need not be more than a record of a contract existing outside of a system or network, which could mean a traditional contract written to and verified by a distributed ledger or blockchain, a hash of a promissory note, or even an agreement written on a napkin that is scanned, recorded, and appended and verified on a distributed ledger or blockchain. In these examples, distributed ledgers and blockchains act like legal clerks maintaining databases of contracts, rather than as instruments of a bottom-up redefinition of contract law.

The remedial analysis of smart contracts in this article highlights concerns regarding smart contract legitimacy and validity by arguing that these electronic agreements promote a false sense of “legal” certainty through persistent execution that cannot account for the need for remedies in contract law and theory. Put another way, “[s]mart contracts do not distinguish intent and even undesired transactions may be effectively impossible to reverse”.9 This matters because, as Sir Geoffrey Vos maintains: “What will ultimately be of most significance

7 Sir Geoffrey Vos, End-to-End Smart Legal Contracts: Moving from Aspiration to Reality”, Ch 1 in this volume.

8 Blockchain Technology Act 2020 (Illinois) (‘Blockchain Act’), s.5

to those using smart contracts will be the remedies that they can obtain when things go wrong”.10

In connection with concerns for remedial legitimacy, the chapter also highlights what I claim to be a *fetishization* by smart contract stakeholders of contractual perfectibility and totality in electronic agreement design, represented here by the image of the “supertoy”.11 As a factor operating within turbulent and blunt attempts to “revolutionize” or “disrupt” legal principles and processes, the fetishization of smart contracts conceals the superficiality of technolegal reason. It also devalues the legal status of smart contracts by failing to account for the full extent and complexity of contract law and theory, especially regarding the importance of remedies, and it threatens to create new fronts of uncertainty and dispute in traditional contracting. Fetishization of contracts by designers of (and stakeholders in) smart contracts also risks diminishing contracts as a legal and social institution, reimagining them as software applications, products, and commodities.

2. Prelude: the Persistence of “Supertoys”

Before looking at the issues surrounding smart contracts in depth, however, it is convenient to return to Spielberg’s film *AI* to introduce an overarching jeopardy confronting the law on smart contracts. It is a jeopardy inclusive of problems with the legal status of (wholly or partly) automated (“smart”) agreements, and apprehensions surrounding the stability and reliability of these forms of agreement in fact and law – especially regarding uncertainties as to remedies at law and in equity.

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10 Vos (n 7) 6

11 There is no single definition of fetishism, this is because it is highly culturally contingent. For present purposes a reasonably general account of fetishism will be applied. Following the fetishisitic nature of the “supertoy”, smart contract fetishism - or the smart contract as fetish - implies ‘a meaningful and powerful object’, the fetish-thing as ‘an agent to which henceforth the fetishist is bound out of respect, fear or desire. The thing therefore assumes the power to effect and generate loyalty’ - Hartmut Böhme, *Fetishism and Culture: A Different Theory of Modernity*. Translated by Anna Galt. (De Gruyter, 2014) 4
AI centres on David, a lifelike robotic or “mecha” boy adopted by Monica, his “mother”, as a substitute for her son Martin, whom she presumes dead and in cryogenic storage. When Martin unexpectedly returns to life and comes home, however, the two boys begin a jealous rivalry for the affection of their mother. In the scene in question, Martin goads David into agreeing to cut a lock of Monica’s hair while she sleeps, on the condition that Martin will then tell his mother that he truly loves David like a brother (in the expectation that Monica will to love David like her own son). In the quoted dialogue, the two boys make promises, set out obligations, and ultimately forge an agreement – one that David’s “mecha” logic interprets as both complete and fixed despite acknowledging, even if not fully articulating, that there are risks involved and implied moral conditions surrounding the agreement that he ought not contravene.

That David attempts to perform the agreed task, despite protesting to Martin (“I can’t Martin, I’m not allowed”), is crucial to understanding the persistent logic that underscores the formation of the boys’ agreement. David’s performance avoids disfiguring the positivity of the agreement: he has made a promise that he must keep, and his protest registers only as vague and ultimately noncommittal. Martin secures David’s promise by enacting his own brute, narrow, and persistent logic. In every sense, David is Martin’s conduit, an automated proxy through which Martin can demand, seemingly without limit. Using David in this way allows Martin to avoid human gestures of negotiation or deference towards a counterparty, instead relying on the persistence of the machine to get what he wants.

David is a useful way for Martin to achieve his goal, but only by ensuring that he acts at once within and against his programme. David knows it is wrong (unconscionable) for him to act where this violates other rules or agreements previously made (“I’m not allowed”) and that sneaking up on his mother brandishing a pair of scissors is a reckless and unreasonable course of action (“I can’t, Martin”). Martin, therefore, deliberately strips David’s understanding of the arrangement of any context burdened with the inefficiencies of moral messiness.

At no point does Martin offer David the opportunity to unwind or change the agreement, which, given the extent of David’s autonomy,
one could assume he would use if given the chance. Instead, Martin outlines the conditions of the agreement and David programmatically executes that agreement, thus reaping a series of *ex post facto* consequences for which Monica must devise repercussions and remedies to address not only what she sees as a blatant risk to her that David now represents, but also the uncertainty that David’s persistent logic brings to bear on broader aspects of their domestic and familial relationship.

David has an impoverished level of knowledge and understanding of the agreement and its formation, revealed by his unquestioning willingness to perform the agreement irrespective of the costs or benefits. Above all, it highlights a grave inflexibility of persistent logic that is unable (or unwilling) to register the *context* against which David and Martin make their agreement. The problem is not, therefore, a mere uncertainty that David comes to represent, it is an *excessive certainty* that creates both concern for Monica and drives her subsequent need to apply harsh measures she hopes will contain David’s behaviour.

David is not human, so by definition the certainty he generates is alien. Yet, this cannot detract from the fact that his actions have consequences in human reality; ultimately, David’s excess of certainty leads his parents to doubt and distrust him, because they are no longer capable of recognising the fallibility one finds in the character, promises, or actions of a “real” child.

**Smart contracts as techno-legal supertoys**

Like David, a smart contract is a progeny whose parents - in this case, traditional contract law and theory - must confront the radical unknowability of their offspring. This begins with questions of whether smart contracts fit the longstanding common law tradition of “contract” at all, including regarding remedies and established modes of contractual conduct. The alternative is to treat smart contracts as lesser, informal agreements with little or no formal legal status. This is because smart contracts arguably privilege performance and notions of perfectibility that are antithetical to the porosity of traditional contracts.

What smart contract design needs to understand is that, if human interests remain the central feature of contract, there will always remain
divergences of interests, failures of minds to meet, and the likelihood of dispute overshadowing the process of contract formation. Neither smart contracts nor the distributed ledgers or blockchains that support their use will easily solve these issues, if at all. An important question is, therefore, whether machines can devise and perform peer-to-peer agreements and prevent disputes between human actors that follow in the wake of such agreements or arise during contract performance.

Underpinning this problem is the question whether a cure for the ills of smart contracts is as understandable and necessary as for any form of agreement. Remedies obtained through litigation, mediation, or arbitration would mean lawful dispute resolution and enforcement, giving legitimacy to smart contracting as a legal process in toto.

In some evaluations, we see ethics and morality as unnecessary conditions or considerations because of the commercial artificiality of the parties who may use electronic agreements (e.g., corporate actors) and see utility or welfare maximisation as the goal instead. Dismissing ethical frameworks as a guide to smart contract morality is not a good idea, however, primarily because we need to apply constraints on the persistence of automation, which laws and regulations alone cannot do. The moral pause is something Martin resists in favour of utility precisely because his aim is to discredit David as a moral subject. Martin knows David is a machine, not an actual boy with moral probity, and uses this to his advantage despite David’s moral effects (the effects his behaviour has) on the world in which he lives.

3. Smart, but not Intelligent, Contracts

While premodern forms and institutions of magic, myth and cult, religion and festivities begin to disappear in the modern era, the

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energies and needs bound up within them do not. Instead they are released and now pervade all levels of modern social systems. Unlike David, (artificial) intelligence does not describe smart contracts or how they operate in many present use cases. But, I argue, smart contracts appear akin to science-fiction writer Brian Aldiss’ conception of “supertoys” because they provide a “way to link computer-circuitry with synthetic [legal] flesh” (my addition). Designers can make smart contracts appear at once intelligent and legally legitimate although they are, in substance, neither. They do, as Mireille Hilderbrandt might suggest, apply mechanical and logical rules without leaving room for the contestability of facts and norms. J.G. Allen echoes this analysis, claiming that “many of the software processes currently hailed as ‘smart contracts’ are indeed more accurately described as performance mechanisms”. It is also on this basis that I refer to the fetishization of smart contracts or, perhaps more accurately, fetishization of the legal legitimacy and certainty smart contracts appear to provide or facilitate.

David’s persistence in performing his promised obligation is, however, a recognisable and pronounced feature of smart contracts to “algorithmically specify and autonomously enforce rules of interaction”. Once set in motion, a smart contract runs until the task designed for it is complete and thus “fully performed” according to its programme. But a lack of “intelligence” – in particular the facility of

13 Böhme (n 10) 8
14 Aldiss (n 1) 4
18 It has been suggested that smart contracts could run forever due to a problem in computer science known as the Halting Problem, which is rooted in the notion that ‘no
adjusting or testing the programme to deal with contingencies – makes smart contracts blunt tools rather than sophisticated legal instruments for transacting value and data. The duality of smart contracts as “tools” and “instruments” is crucial for understanding their legal significance, although there is no neat binary distinction. I will return this duality, and its relative messiness, again throughout the chapter.

A lack of contingent intelligence has led to a reliance on “data feeds” or “oracles”, third party aggregators that supply smart contracts with necessary data and information (e.g., data from a meteorological station), to connect them to the “real world” and enable effective operation. There is a prominent “oracle problem” that foreshadows the development of smart contracts; not least, as Ethereum founder Gavin Wood points out, that the “accuracy and timeliness of this information is not guaranteed and it is the task of a secondary contract author – the contract that utilises the data feed – to determine how much trust can be placed in any single data feed”. Analysis of the differences between electronic (and automated) contracts as “smart” or “intelligent” is also a means of understanding the duality between smart contracts as tools versus instruments, and a good example of why we cannot consider the duality a neat distinction.

**Emerging definitions of “smart contracts”**

To understand the place smart contracts might hold within the common law tradition of contract in the coming years, it is necessary to build on the definition discussed so far by comparing and contrasting traditional

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19 Wood (n 15) 15
contracts with smart contracts. We begin with some recent examples of the legal definition of smart contracts and their characteristics.

The Wyoming State legislature, in a draft Bill on digital assets, adopts an approach to definition that appears to apply legal parameters to Buterin’s definition:

“Smart contract” means an automated transaction […] or any substantially similar analogue, which is comprised of code, script or programming language that executes the terms of an agreement, and which may include taking custody of and transferring an asset, or issuing executable instructions for these actions, based on the occurrence or nonoccurrence of specified conditions.20

Similarly, the wording applied by the Arizona State Legislature takes a rigorous techno-legal approach:

“Smart contract” means 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.21

Thought leadership from the law firm Norton Rose Fulbright (with cryptologist Ian Grigg) adds important legal qualifications:

Smart contracts will often be used to document bilateral obligations between a User and a Counterparty. Smart contracts inherently deal with issues of evidence and intention that are behind some formality requirements – but, until legal systems add rules dealing specifically with smart contracts, these formalities will still need to be satisfied.22

Initial conceptualizations of smart contracts maintained that the two variations, smart and traditional, would not perform the same tasks


and, therefore, achieve the same legal outcomes.\textsuperscript{23} This raises two fundamental issues. First, if smart contracts are not challenging, or are incapable of challenging traditional contract law and theory, then what is the point of them? Second, smart contracts may be little more than a niche intervention that will improve cost effectiveness and efficiency in a limited array of contractual scenarios. Massimiliano Granieri claims that the impact of technology on contracting (and contract law) has been interpreted “mainly in terms of transaction costs reduction, since technology is instrumental to form agreements in a more expeditious way, regardless of the distance between contractors”; in this respect “the advent of technology in contract law has too often and too simplistically been considered the same as e-commerce.”\textsuperscript{24}

A further tension of importance to smart contract design is between bargained contracts and standard form contracts, otherwise known as “boilerplate”. Smart contracts, in the immature form we find them, are more like boilerplate than complex varieties of contract that rely more on contingent flexibility. But smart contracts as boilerplate inherit and risk the proliferation of a range of issues that surround such supra-defined agreements. Margaret Jane Radin points to a fundamental consumer concern with boilerplate which, I suggest, could equally describe smart contracts (not least because the context in which boilerplate agreements are most pervasive is online or in peer-to-peer digital networks):

[M]any of the interactions that are called “contracts” these days are very far from the traditional notion of contract, the idea of bargained exchange by free choice, that still holds sway in our imaginations. Contract reality belies contract theory in many situations where


\textsuperscript{24} Massimiliano Granieri, Technological Contracts. In Pier Giuseppe Monateri (ed), \textit{Comparative Contract Law} (Edward Elgar Publishing Ltd., 2017) 408
consumers receive paperwork that purports to alter their legal rights. In these situations, contract theory becomes contract mythology.\(^{(25)}\)

We can describe conventional contracts as agreements creating obligations enforceable by law,\(^{(26)}\) or as the law “based on liability for breach of promise”.\(^{(27)}\) These definitions show that contracting does not involve only the creation and performance of promises and obligations, but also the need for remedies if interparty expectations based on those promises need enforcement. As suggested earlier, enforcement can imply a moral duty under state-sanctioned principles of contract, especially where it is socially desirable for contractual promises to maintain a moral character. But utility or welfare maximization also applies and changes the complexion of enforcement from one of moral duty to other means of ensuring performance, for example, the desire of contracting parties to maintain an excellent reputation in business.\(^{(28)}\)

As Atiyah concludes, “it is not very meaningful to say that a promise is binding unless some further explanation is given of what sort of remedy is offered for its breach”.\(^{(29)}\) Breach of contract is a vital sign of healthy contract law, not an inconvenience to be “programmed out” of agreements. Breach shows that a “definition of contracts in terms of sets of promises does not give full force to the interrelationship of the obligations of the parties which exists in many contracts”, an interrelationship which we see particularly in the remedy's availability for substantial failure in performance, by which an injured party may


\(^{(26)}\) The definition echoes that set out in the Proposed Regulation on a Common European Sales Law, which defines “contract” as “an agreement intended to give rise to obligations or other legal effects”: see Hugh Beale (ed), *Chitty on Contracts*. (Sweet & Maxwell, 33rd ed, 2018) 1-025


\(^{(28)}\) Schwartz and Scott (n 11) 17-19

end his own obligations because of the failure of the other party to perform his side of the bargain.30

Contracts are best classified in and by their context, with two broad taxonomies being consumer and commercial contracts, both of which we can further subdivide depending on purpose, application, mode of regulation, and so on. There has long been a tension between consumer protectionism and the forces of market individualism, especially in English contract law, which has helped to shape modern contracting practices within capitalism in terms that support both consumer and commercial interests and demands.31

It would be wrong, therefore, to think technology will ease longstanding tensions. Emerging as they do from a blockchain ecosystem built around the premise of enhancing individual and corporate economic and market engagement, smart contracts are more likely to amplify market individualism and exacerbate tensions in play. This likelihood becomes more apparent when considering how smart contracts fit around determinations of static and dynamic market individualism, where the former maintains “the principal function of contract law as being to establish a clear set of ground rules within which a market can operate”; and the latter, “a more flexible approach, guided by the practices and expectations of the contracting community (particularly the commercial community).”32

Flexibility is not a strong attribute of smart contracts, although this is being addressed in a variety of ways in smart contract design. The relevance to smart contracts of the flexibility inherent in dynamic market individualism comes from the onus on market agility demanded by commercial actors. Coupled with the market-supporting principles of static market individualism coded into smart contracts, the ability of commercial (or private) market actors to process transactions at speed

30 Beale (n 24) 1-020

31 See, for example, Michael Furmston (ed), The Law of Contract. (LexisNexis, 6th ed, 2017) 1.105

32 Furmston (n 30) 1.108 and 1.109
and with greater efficiency than traditional contracting potentially makes smart contracts an attractive option for securing future agreements.

**The rhetoric of efficiency**

Efficiency is a key definitional marker of electronic agreements. It describes a shift in technological function that continues to leave human capabilities in its wake. It also describes ideological determinations of socioeconomic primacy that consider a moral society beginning with well-organized, systematic information management. We can define and interpret efficiency, therefore, in a variety of ways. However, efficiency makes its most obvious and impactful claims based on the brute capabilities of the “electronic” or “automated” surpass human cognitive capacity and agility. In a 1995 article on the interrelationship between cognition and contract, Melvin Aron Eisenberg described how flawed contracts were really a matter of human cognitive deficiency (“rational ignorance”) albeit flaws accepted as the norm because most actors did not want to spend significant amounts of energy or money on perfecting contracts:33 “Our abilities to process information and solve problems are constrained by limitations of computational ability, ability to calculate consequences, ability to organize and utilize memory, and the like”, claimed Eisenberg, “hence, actors will often process imperfectly even the information they do acquire. Such imperfections in human processing ability increase as decisions become more complex and involve more permutations.”34

A presumed efficiency gain, therefore, lives in the ability of smart contracts (and other types of electronic agreement) to solve the deficiencies Eisenberg highlights – thus drawing nearer to a perfect form of contract. Unfortunately, definitions of the perfection smart contracts ostensibly represent is within limits that do not extend anywhere near the complexity of contract law. Smart contracts represent a very limited statement on efficiency; they are good at what

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34 Eisenberg (n 31) 214
they do, and can undoubtedly surpass human cognition on the range of tasks and objectives set for them, but what they do is far too simple in comparison to the demands of contract law.

Where efficiency arguments regarding smart contracts develop further, however, is in the ability for the agreements to be self-enforcing, in the sense of including arbitration and litigation clauses in the contract’s function, thus saving time and money on classic litigation issues of, for example, truth-finding and disclosure.35

4. Legally Weak?

“Whether a particular right can be called a remedy”, claims Peter Birks, “depends entirely on whether its relation to its causative event triggers the metaphor of cure.”36 Given that smart contract performance is all but guaranteed, and that breach (at least in terms of a failure to perform) is improbable, there are two remedial areas of relevance – both of which refer to performance expectation and returning a claimant to a position they were in before the contract.

These are, first, expectation damages awarded as compensation to cover poor quality goods; and second (importantly, given the proliferation of smart contracts designed to transact and transfer value rather than goods) restitution to recover overpaid sums (unjust enrichments). If we are to treat smart contracts like other (“legal”) contracts, then focusing on the most appropriate and effective remedy for disputes must remain a priority. Equity or restitution are key because smart contracts programmed to transfer money (or other value) will unquestioningly do so; the co-identification of funds and proprietary rights, and the recovery of value in whatever form that prevails will be a priority for claimants over mere damages or compensation (be it fiat currency, cryptocurrency, or other “tokens”).

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35 For an analysis of efficiency gains in contract design, see, Robert E. Scott and George G. Triantis (n 5)

36 Peter Birks, Unjust Enrichment. (Oxford University Press, 2nd ed, 2005) 165
In this regard, the notable feature of the early cryptoasset case *AA v Persons Unknown*\(^37\) was the claimants’ preference for proprietary rights overcompensation. Smart contracts could, therefore, herald a turn to equitable remedies or, perhaps, a rise in restitution as the most effective response to electronic and machine-enabled transactions that do not fulfill the intentions of the parties. This pairing of an electronic instrument with a contractual remedy to form a legally robust “smart contract” echoes, once again, the “supertoys” analogy as smart contracts arguably assume the appearance of contractual legitimacy wrapped in legal flesh.\(^38\)

**Smart contract ideals and contingent reality**

Considering the “ideal” smart contract as impervious to the vagaries of classical agreement-making may help assuage counterparty concerns over the risks of performance, but is it an accurate portrayal? I suggest not, because they defeat neither the latent problems in traditional agreement-making, nor risks concerning performance. Instead, like the naivety of David and Martin in *AI*, smart contracts are gross oversimplifications that belie the complexities and the nuances of classical contract law and theory – including the actuality, and even necessity, of incompleteness, and the place of orality in agreement-making and contract formation.\(^39\)

Perhaps above all, it is the far-reaching insistence and adaptability of a variety of remedies available to parties when agreements fail that makes

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\(^{38}\) The notion of smart contracts as mere “instruments” is crucial because it refers to the mode of *recording* a contract rather than the *contract as such*. If smart contracts are little more than instruments, then their legitimacy as a means for the transaction of value or rights diminishes significantly.

\(^{39}\) For instance, it is not immediately apparent if or how something as basic as the translation of express terms in oral agreements and reasonable intentions of the parties feature in smart contracts. In the broader case of electronic contracts, attempts have already been made to ensure that oral preconditions in contract formation can survive technological change in the form of non-oral modification clauses (NOM). The validity of such clauses has recently been affirmed in the UK by the Supreme Court in *Rock Advertising Limited v MWB Business Exchange Centres Limited* [2018] UKSC 24
contracting more that the mere “execution” of a transaction.\textsuperscript{40} The threat of errors and bugs in smart contract design makes it prudent to keep them as basic agreements, but this means that they will continue to be incapable of reflecting the depth and variety of contract law and theory.\textsuperscript{41} It is absurd and untrue to say that traditional contract drafting does not suffer from errors – that is precisely why remedies play such a vital role in the overall landscape of contract law.

We can view many features of contract law as “problems” to be “solved” - those symptomatic of inefficiencies that electronic and smart interventions “disrupt” – but contract law and theory are not just gratuitously complex. Rather, their complexity has evolved to reflect the heterogeneity and complexity of socioeconomic interactions and transactions in a wide variety of interpersonal and commercial environments. Contracting is an indelibly human gesture, and thus subject to the caprices of human conduct and endeavour. If contracts are to cease being so, by their autonomous, smart reconceptualization, then it is arguably human interest and interference that must retreat to make contracts smart. And yet, as Sol Yurick said of the broader march of the Information Age, this endeavour implies “a perhaps fictional notion; that the universe and everything in it, is logico-mathematical”, and that “all things and forces in the universe [can] be treated as a cryptogram, a code, a text that [can] be read, sooner or later”.\textsuperscript{42} The pause in time that law and legal processes foster ensures (or ought to ensure) thorough consideration of the value and nature of agreements. To paraphrase Yurick, this is a commendable value in, and benefit of, the law, which insists on a messy, base-level of humanity that confounds the notion of a purely logico-mathematical universe.

\textsuperscript{40} See, for example, Robert Herian, Smart contracts: a remedial analysis, \textit{Information & Communications Technology Law}, 30:1 (2021), 17-34

\textsuperscript{41} The Consensys Github page dealing with Ethereum smart contract best practice suggests that designers keep contracts simple because ‘complexity increases the likelihood of errors’ (https://consensys.github.io/smart-contract-best-practices/general_philosophy/)

\textsuperscript{42} Sol Yurick, \textit{Metatron} (Semiotext(e), 1985) 26-27
The immature disruptive potential of smart contracts

Contemporary computing undertakes mundane bureaucratic processes and achieves transactional speeds far greater than those that human operatives could ever hope to achieve. Perhaps it is only when impressive speed – and the desired efficiency that accompanies – it ceases to serve human interest, however, that we can begin, seriously, to talk of technological “disruption”. On this account, smart contracts are an immature example of “disruption”, where the notion of disruption as a marker of radical or meaningful progress is highly contestable within the present socioeconomic milieu.43

Of course, the technology may be a catalyst for significant change in economies and societies by enabling the uncoupling of human actors (and their interventions and interests) from some or all socioeconomic duties and responsibilities. This is a vision of alienation par excellence, but arguably one in which the growing distance between humanity and its productive machines might stabilise and comfort society, rather than provide a basis for socioeconomic or political evisceration.44

This post-industrial utopia is not exactly where we are heading with any certainty, however. As if to highlight this, it is abundantly clear that

43 See, for example, Herian (n 2)

44 A similar notion has been elaborately expressed by Yanis Varoufakis, former Greek finance minister, in his discussion of a future based on a vision of Star Trek (utopian) or The Matrix (dystopian): “Star Trek is this: we’re all sitting around having philosophical conversations like in the ancient Agora in Athens and the slaves are not human. There are holes in the walls on the Starship Enterprise; you ask for something and it comes up. Fantastic. So then you can explore the universe and talk to Klingons. That’s one choice – the utopia. The dystopia is The Matrix, where the machines are being fed by our own energy. We are plugged into a false consciousness that the machines have been created to keep us happy. We think we are leading a perfectly normal life, but all along we are the slaves of the machines. So these are the two extremes. And the choice whether we go to Star Trek or The Matrix is ours. It’s a political choice.” Brian Eno and Yanis Varoufakis, Brian Eno meets Yanis Varoufakis: ‘Economists are more showbiz than pop stars now’. The Guardian (online, 28 November 2015) https://www.theguardian.com/lifeandstyle/2015/nov/28/conversation-brian-eno-yanis-varoufakis-interview (last accessed 9 July 2021).
smart contracts (like many “smart” ideals) have bugs that pose what Werbach and Cornell suggest is a “significant limitation in replacing human enforcement of agreements with software running on the blockchain”; things, they rightly say, “simply do not always go according to plan”. The opportunity to change or stop electronic agreements that cease to reflect the consent or reasonable expectations (“good faith”) of the parties seems more important than ever. And remedial orders such as rescission, which enable the unwinding of agreements, seem like common sense – not an inefficient burden on today’s socioeconomic condition.

Ordinarily, it is wrong to view contracts as immutable (complete and fixed), especially regarding one of the most significant consequences of rescission, that of treating the contract as though it never came into existence. There is arguably good cause, therefore, for this precise principle to remain in place in a world of poorly designed, ill programmed, or bug-ridden smart contracts. As such, smart contract designers should accommodate the need for erasure or, at the very least, a capability to overwrite. To grasp the relevance of remedies in a world of smart contracts, it is necessary to examine some key characteristics that plague the case for smart contracts as legally binding and enforceable. The legal weaknesses in smart contract design and implementation that make remedies not just an inconvenient necessity, but an inevitability.

**Contract law remedies and risk-allocation**

As an institution, contract law enables parties to distribute and allocate risk. Key to achieving both ends is not a slavish adherence to formalism

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46 Cardozo J in his judgement in the New York Court of Appeals in Beatty v Guggenheim Exploration Co (1919) 225 NY 380 maintained: ‘Those who make a contract, may unmake it. The clause which forbids a change, may be changed like any other. The prohibition of oral waiver, may itself be waived. Every such agreement is ended by the new one which contradicts it’.

47 As per Lord Wilberforce in Johnson v Agnew [1980] AC 367
but, on the contrary, the need for flexibility inherent in the contractual form and process that reflects contingencies and the common-sense notion that things do not always go according to plan. Flexibility is woven through the fabric of contractual principles, doctrines and theories to serve the expansion of domestic and international markets and commercial enterprises; it assumes a variety of forms that aim, paradoxically, to provide certainty, stability, and predictability.

These stable flexible principles include the ability to change a contract (rectification), or unwind an agreement made, for example, under duress or because of an unconscionable bargain (rescission); both of which, ultimately, put parties back in a position they would have been but for the agreement or if they did not perform the agreement as intended (restitution). As previously suggested, restitution is vital to the suite of remedies for breach of contract, and there is every chance that parties in a future of smart contracts will demand more not less restitution because failure to perform no longer represents the same level of risk or threat it otherwise does in conventional agreements.

Accompanying many remedies relating to the breach of contract are damages and costs for litigation. In contrast, the equitable remedy of specific performance enables enforcement of an agreement for which money (damages or compensation) does not suffice. To undermine or dismiss remedies rooted in performance seems academic in a world of smart contracts, because the one thing smart contracts almost always guarantee is performance. Yet the mere fact of their insistence on performance does not mean smart contracts “solve” the “problem” of a suitable remedy for situations in which monetary compensation is not suitable or desirable. Equity, as Sarah Worthington points out, developed specific performance (and injunctions) because the monolithic approach of the common law to contracts became

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48 In English law, contract is not necessarily the best mechanism through which to exercise this flexibility. Constructive trusts, for example, are more flexible still. Yet law’s development of additional flexibility via trusts does not discount the flexibility that can be found and is utilised in contract.

49 See, for example, Atiyah (n 27) 402-403
inappropriate and “ignored the relativities that society attached to
different contractual rights”.\footnote{Sarah Worthington, \textit{Equity}. (Oxford University Press, 2\textsuperscript{nd} ed, 2006) 25} Smart contracts do not change this, but
if allowed to side-step performance-based remedies in equity and
remedies at common law alike, they could threaten to undermine
contractual rights further.

Much of the work smart contracts do concerns transactions for value
relating to currencies and tokens (“fiat” and “crypto”). The next logical
step therefore would appear to be processes built into smart contracts
or affiliated with smart contract activity (i.e., blockchains supporting the
smart contract), triggered if parties require a remedy for compensation
or damages. Where parties lose value, or one party is unjustly enriched,
automated payback of value would be a proportionate response. The
transaction and trade of financial products such as bonds and securities
thus offer obvious and potentially profitable domains for smart
contracts.

Less clear, however, is the use of smart contracts in contractual domains
where enforcement of performance is preferable to compensation for
breach – service contracts for instance. Tokenisation, as a species of
value or representation of right (e.g., property right) relating to
blockchain use including smart contracts, differs from transactional
modes that are not exactly “financial” but does not address (or fully
address) contracts for which performance is key.

Monitoring the performance of smart contracts, especially where
agreements may not occur only online or within a network or system, is
a significant obstacle to implementing smart contracts in services. This
problem brings us back to the so-called “oracle problem”, but it also
relates to existing challenges in contract performance monitoring that
gave rise in English law to Civil Procedure Rules concerning so-called
“disobedient parties”.\footnote{Part 70 - General Rules about Enforcement of Judgments and Orders. \url{https://www.justice.gov.uk/courts/procedure-rules/civil/rules/part70} (last accessed 9 July 2021).} As monitoring the performance of a service
contract increases – consider a contract for the construction of a house,
for instance – the level and sophistication of data collection required to satisfy the remedy, enforce the right, and discharge the contract increases. It is possible because surveillance technologies already exist that can undertake monitoring of this sort. But inevitably this will stretch smart contract design capabilities and thus potentially exacerbate points of weakness already within the smart contract design processes.

*The broader social function of “contract”*

Mistakes, as they say, happen. But in contract law, mistakes assume significance regarding contract frustration.\(^{52}\) Courts aim to uphold contracts when and where possible, but this is not always desirable on the facts. Such processes show that contract is flexible, contingent, and – perhaps above all else – reflects the inherent messiness of human enterprise that leads, all too often, to mistakes and frustration of agreements. This, for some technologists, may be reason enough to find a “solution” to the “problem” of traditional contract law. But it is incumbent on smart contract designers to remember that contracts do not only exist in an immature state, like vending machines. Nor is it desirable to “fix” the apparent problem if doing so jeopardises the balance between the express and consensual execution of rules-based agreements, on the one hand, and the moral obligation of promise and performance, on the other – both of which are central tenets of legally binding agreements.\(^{53}\) Put another way, contract is a legal norm that has successfully underwritten and influenced many social structures far beyond the abundance of today’s commercial transactions. The question of how “post-trust” electronic agreements might influence social relations more widely is one to take seriously, therefore, and it is

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\(^{52}\) See, for example, *Great Peace Shipping Ltd v Tsavliris, The Great Peace* [2002] 4 All ER 689.

\(^{53}\) This points to the laws of equity and restitution, especially within Anglo-American common law jurisdictions, both of which work in and around the law of contract to ensure *inter alia* that a fair and reasonable balance is maintained between the bargaining powers of parties and that grounds for unjust enrichment or unconscionable bargaining are mitigated.
important to note the impact of greater levels of inflexibility, demanded in the name of efficiency, on heterogeneous environments.

To address this issue, it is necessary to explore ways in which smart contracts could or, perhaps, need to be more flexible. Ongoing initiatives, for example the ERC1538: Transparent Contract Standard developed by Ethereum smart contract designers, addresses the general inflexibility of smart contracts and seeks to create conditions whereby variations in contract terms ("functions") are possible.54 Addressing the vexed issue of smart contract immutability _qua_ flexibility is vital if they are to better align with traditional contract law.55 But it is also clear that smart contracts lose something if they shed their fundamental and desirable immutability – namely the ability for parties or individuals to execute contracts without having to trust one another. As the author of the standard maintains:

Immutable, trustless contracts cannot be improved, resulting in increasingly inferior contracts over time. Contract standards evolve, new ones come out. People, groups and organizations learn over time what people want and what is better and what should be built next. Contracts that cannot be improved not only hold back the authors that create them, but everybody who uses them. In some cases immutable, trustless contracts are the right fit. This is the case when a contract is

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54 Nick Mudge, _ERC1538: Transparent Contract Standard #1538_. (31 October 2018) [https://github.com/ethereum/EIPs/issues/1538](https://github.com/ethereum/EIPs/issues/1538) (last accessed 9 July 2021). The standard addresses the following technical issues: (i) A way to add, replace and remove multiple functions of a contract atomically (at the same time); (ii) Standard events to show what functions are added, replaced and removed from a contract, and why the changes are made; (iii) A standard way to query a contract to discover and retrieve information about all functions exposed by it; (iv) Solves the 24KB maximum contract size limitation, making the maximum contract size of a transparent contract practically unlimited. This standard makes the worry about contract size a thing of the past; (v) Enables an upgradeable contract to become immutable in the future if desired.

only needed for a short time or it is known ahead of time that there will never be any reason to change or improve it.56

**Smart contracts and legal language**

From the point of view of legal services, but also wider business interests, the legitimacy and scalability of smart contracts turns on the matter of *contractual language*. Consider the relative legibility and accessibility of natural language contracts (English as a common standard for international trade and consumer contracts, for example), compared with the computer language or code of smart contracts. Under s. 7 of the Unfair Terms in Consumer Contracts Regulations 1999 (SI 1999, No. 2083), for example, written contracts must be expressed in plain, intelligible language, and “coded” smart contracts do not meet this requirement.57

Recall the Illinois General Assembly’s definition of smart contracts: “a contract stored as an electronic record which is verified by the use of a blockchain”.58 In this example, it is entirely possible for a traditional, natural language contract to form the basis of the electronic record, as, for example, a scanned hard-copy (paper) contract or PDF. This does not disturb the need for natural language, and retrieval and interpretation of the contract could remain a familiar task to the lawyer or paralegal. Compare this to Vitalik Buterin’s definition: “a smart contract is a computer programme that directly controls some digital asset”.59 Here, no documentary form of a contract exists beyond the electronic environment created for its execution, and there is no sign of the use of natural language capable of being easily read or interpreted by the contractual parties – unless those parties are familiar with “reading” code. It embeds the smart contract in the property conveyed or formed at the moment of transaction, and “written” in code is, perhaps, only communicated to another machine.

56 Mudge (n 50)
58 Blockchain Act (n 8)
59 Buterin (n 4)
Yet, while embeddedness and invisibility may cause problems regarding contract legibility and intelligibility for the parties subject to it, smart contracts appear to satisfy a key feature of traditional contract formation, the establishment of an enforceable *pre-written* promise.\(^60\)

Usually, promises are binding if made orally or reflected by conduct that evidences the promise or intentions of the parties to form a contract. With smart contracts as defined by Buterin, however, a promise (or even an effective agreement) exists (latently) *in the property that is the subject matter of the transaction*, and the promise exists not unlike implied terms or clauses in traditional contracts.\(^61\) Instead of *ex post* adjudication to interpret and expressly define an implied term, a smart contract executes because the agreement is always *already* valid.

**Smart contracts and good faith**

The pre-written stage in contract formation raises one final important question: the ability of smart contracts to mirror good faith principles and the reasonable expectations of parties. As a script, a smart contract is a documentary form that can *evidence an agreement*, even if not precisely the formation of a contract as defined at law. The matter of oral agreements (promises made) as binding based on evidence of the consensual intention of the parties is a long-settled and general rule applicable to most types of property. How can smart contracts ensure this rule remains in place, including associated considerations of good

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\(^{60}\) In the common law context, it is especially important that this aspect of smart contracts is tested with regard to a variety of remedial actions, notably resulting and constructive trusts and estoppel. Resulting and constructive trusts, for example, have proven to be important safeguards in cases where a contract was obtained by fraudulent misrepresentation (*Lonrho plc v Fayed* (No. 2) [1992] 1 WLR 1; *El Ajou v Dollar Land Holdings plc* [1993] 2 All ER 717)

\(^{61}\) Implied terms are distinguished from express terms. Express terms are ‘actually recorded in a written contract or openly expressed at the time the contract is made. But there are cases in which the law implies a term in a contract although it is not expressly included therein by the parties. An implied term may be a condition, a warranty or an intermediate (innominate) term’: Beale (n 24) 14-001.
faith? If the answer is that we can “code” oral agreements or good faith into smart contracts, for example by using a lawyer or notary trained in smart contract design and formation, can we consider this an improvement upon existing practices or a mere reinvention of them? There is also a tension that arises between good faith principles, as a standard for fair dealing within contractual contexts, and the promise of smart contracts (and blockchains) to foster “trustless” or “post-trust” transacting regimes. If smart contracts negate good faith by design, this places a burden on smart contracts to maintain conditions in which good faith is no longer necessary.

Implicit in this discussion is the notion that smart contracts can or will radically alter legal conduct in ways that continue to reflect good faith, even in the absence of that principle. For smart contracts to achieve this, or many of the key points covered above concerning forms and processes of flexibility and language, design beyond what we are currently seeing is required. Whether aligning smart contracts with traditional contract law is a project that will come to be seen as desirable (or necessary) by technologists remains uncertain. It may be a step too far on a cost-benefit analyses, with the preference remaining instead on basic, vending machine-style transactions that carry less risk and lower maintenance costs. Committing to the project of aligning smart contracts with traditional contract law means ensuring the weaknesses of smart contracts do not unreasonably impact or infect contract law. Equally, however, smart contracts should not exacerbate the flaws and imperfections of traditional contract law.

5. Conclusion

Peer-to-peer service, property and financial agreements and arrangements, modes of exchange, transaction and conveyance are all the subject to re-evaluation in light of current developments in the field of smart contracts. In this chapter, I have argued that, contrary to the notion of smart contracts “disrupting” existing contract law and theory,

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62 For example, in England and Wales, s. 53 Law of Property Act 1925 stipulates that written agreements must be used to create or dispose of an interest in land; to declare a trust of land; or in dispositions of equitable interest under a trust.
smart contracts’ legal legitimacy turns upon satisfying a high level of interoperability with the processes and procedures of verification defined by traditional contract law and theory. As Beale et al. explain, “contract law” is used to mean the whole collection of rules which apply to contracts, and these may include many rules that are not “contractual” in the sense of being based on a promise to do something.63 This forms part of the brief that smart contracts must meet if they are to be legitimate and legally recognised; while the dynamic nature of contract means it is “always developing and sometimes changing rapidly as new problems confront the courts and legislature”, a full transition to smart contracts, if it occurs, is unlikely to sweep away all the vestiges of traditional contract law.64 As the UK Jurisdiction Taskforce Legal Statement on cryptoassets and smart contracts succinctly put it: “In no circumstances are there simply no legal rules which apply”.65

Definitions rooted in the fundamentals of contractual form and purpose present, therefore, a clear divergence between law and the visions of technologists – not least when technologists insist that the ongoing project of “disruption” involving blockchain and its associated technologies (e.g. smart contracts) has, once and for all, reinvented the proverbial wheel. While smart contracts are problematic as contracts per se, the problems they pose are not all that new for the law. Yet the threat of divergence is important for entrepreneurs and technologists keen to “leverage” perceived failures in law’s ability to keep pace with innovation. Rather, smart contracts represent an evolution in electronic instruments that have revealed to the legal imagination that, while it is necessary to engage with and understand the novelties different mediums present (i.e., the Internet or analogous distributed networks), centuries of social experience and intellectual rigour that have made

63 Beale, Bishop, and Furmston (n 25) 3
64 Beale Bishop, and Furmston (n 25) 8
contract law and theory what it is today is not easily “disrupted” nor upended.

As Robert A. Hillman and Jeffrey J. Rachlinsk concluded in their assessment of electronic agreements during the first major period of e-commerce, at the turn of the Millennium:

Although the electronic environment is a novel advance in the history of consumerism, existing contract law is up to the challenge. The influences that affect the judicial approach to the enforcement of standard terms in the paper world also affect the electronic world or have close parallels in the electronic world. The basic economics of the two kinds of commerce are identical. In both the paper and electronic worlds, businesses choose between adopting a set of boilerplate terms that are mutually beneficial or exploitative. In both worlds, they know more than consumers about the contractual risks, creating an opportunity to exploit consumers. Also in both worlds, consumers can defend themselves by investigating these terms or by making their purchasing decisions based on a business's reputation. E-commerce brings new weapons and defences to both businesses and consumers, but the basic structure remains intact.66

The problem of bridging real and virtual worlds (the oracle problem) and bringing laws of contract and property into digital harmony, remain major obstacles for smart contract design and implementation.67


67 See, for example, Jerry I-H Hsiao, Smart Contract on the Blockchain-Paradigm Shift for Contract Law, 14 US-China Law Review (2017) 685

Test cases for smart contract viability have tended to rely on tokenization of non-physical property that is amenable to digital exchange and transaction, such as financial products or intellectual property, and this trend has not changed in recent years despite some high-profile attempts to demonstrate that both chattels and real estate can be conveyed using smart contracts. See, for example, John Ream, Yang Chu, and David Schatsky, Upgrading blockchains: Smart contract use cases in industry. Deloitte Insights (blog, 8 June 2016), https://www2.deloitte.com/insights/us/en/focus/signals-for-strategists/using-blockchain-for-smart-contracts.html (last accessed 9 July 2021); Aleksandra Dikusar, Smart Contracts: Industry Examples and Use Cases for Business. XB Software. (blog, 17 October 2017) https://xbsoftware.com/blog/smart-contracts-use-cases/ (last accessed
Whether we ought to see smart contracts as contracts at all remains open to debate.\(^6^8\) We might understand smart contracts instead as a piece within the larger jigsaw puzzle that is contract law, rather than an alternative to or replacement for traditional contracts. It is clear, from a legal standpoint, that smart contracts do not provide a wholly viable alternative to existing forms of contract, nor pose a threat.\(^6^9\)

Despite innovative steps, smart contracts are juridically immature and incapable of satisfying most fundamental conditions of traditional contract law and theory.\(^7^0\) Although complacency by lawyers is unwise and potentially misguided, as Marino and Juels conclude, it is “essential that the architects of this new technology, like the architects of contracts, create viable ways to alter and undo them”.\(^7^1\) “Parties should obviously think about what will happen when things go wrong before they do”

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\(^6^9\) For example, *Chitty on Contracts* does not mention smart contracts in the latest (October 2018) edition, only electronic documents and deeds with regard to provisions in land registration legislation for e-conveyancing measures – Beale (n 24) 1-123

\(^7^0\) The operators of seemingly innovative smart contract applications themselves remain cautious and hesitant regarding the legal force of smart contracts and continue to recommend users seek formal legal advice before agreeing to terms of service. See, for example, Ana Alexandre. Decentralized Aragon Court Now Onboards Jurors To Settle Real Cases. *Coin Telegraph* (8 Jan 2020) https://cointelegraph.com/news/decentralized-aragon-court-now-onboards-jurors-to-settle-real-cases

argues Sir Geoffrey Vos, and, thus, coders are wrong to believe dispute resolution is not required for these methods of transaction, especially given the continued fallibility of the human element involved in smart contracts. Failure to heed this is one account of the problematic fetishization of the contractual form by smart contract designers: they consider the electronic agreement alone to be perfect, when this does not, in fact, describe a contract – only a new techno-legal supertoy.

Vos (n 7) 15