

# Legal Engineering on the Blockchain: ‘Smart Contracts’ as Legal Conduct

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**Abstract** A new legal field is emerging around blockchain platforms and automated transactions. Understanding the relationships between law, legal enforcement, and these technological systems has become critical for scaling blockchain applications. Because ‘smart contracts’ do not themselves constitute agreements, the first necessary ‘legal’ development for transacting with these technologies involves linking computational transactions to natural language contracts. Various groups have accordingly begun building libraries of machine readable transaction modules that correspond to natural language contracting elements. In doing so, they are creating the building blocks for ever more complex transactions that will ultimately define the entire envelope of computational legal conduct in these environments, and likely standardise the field. However, also critical to emerging blockchain ‘legalities’, is the capacity for dispute resolution and legal enforcement. Beyond the performance of parties, or the quality of goods and services transacted, new mechanisms are also needed to address the performance of the computational transaction systems themselves. Such mechanisms are necessary to address the reality that smart contracts cannot be forced to perform actions beyond the parameters of their coding, even by a judicial order. Legal tools, both technological and institutional, are thus being developed to ‘soften’ the effects of self-executing transactions. In this article we treat these developments as law-making practices that are constitutive of an emerging legal field. Legal engineering exercises of this kind are not novel, and by drawing on historic examples from the common law and international arbitration, we gain

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insights into the competitive dynamics likely to be shaping legal engagements on the blockchain.

**Keywords** Arbitration · Automation · Blockchain · Dispute resolution · Emerging norms · Jurisdiction · Law and technology · Legal standards · Platform law · Smart contracts

## Introduction

Automated transactions have found their way into many areas of contracting, both for regular consumers on the internet, as well as financial transactions in the corporate sector. With increased interest in blockchain technologies through initiatives such as Bitcoin and Ethereum, combining automated transactions with blockchain platforms has become a growing field of interest. ‘Smart contracts’ are automated software agents hosted on blockchains that are capable of autonomously executing transactions on the triggering of certain conditions. However, these software agents are capable of executing agreements far more complex than simply sending tokens between blockchain addresses. A new class of legal engineers is now writing smart contracts that can transfer value, pay for real world property and services, license intellectual property, and establish technical rule systems for new forms of organisational and institutional coordination (Davidson et al. 2018). However, these more complex agreements, with greater engagement with real world (i.e. ‘off-chain’) goods and services, highlight the necessity of effective dispute resolution, as well as indicate a necessary interrelation with territorial legal systems. As transactions become more complex, contestation mechanisms are necessary to ‘soften’ the effects of self-executing ‘smart contracts’ and make transactions reversible, allowing the outcomes of dispute resolution to be enforced. Connecting the agreements executed by smart contracts to both their natural language counterparts and to institutions that can arbitrate and enforce rights has thus become a critical blockchain application.

The combination of private agreements executed through computational mechanisms, effective dispute settlement, and the technologies that link them, give these legal and computational environments a ‘jurisdictional’ character.<sup>1</sup> In this article, we describe how the processes of engineering this emerging legal environment are not radically new, but that the evolution of these ‘jurisdictions’ mirrors the historical trajectory of certain common law systems. Accordingly, we claim that the legal quality of these environments need not be identified or identifiable immediately, but is more likely to develop over time while remaining a site of contestation. Further, the governing values of the environment are yet to be established. Indeed, the combination of automated contracts and blockchains with real world dispute resolution raises

<sup>1</sup> For background on the idea that a contracting system combined with a system of dispute resolution can be jurisdictionally generative, see Teubner (1997a, b), including Teubner’s chapter ‘Global Bukowina’ at pp. 3–28. For a discussion of the jurisdictions of investor-state arbitration see, for example, Dolzer (2005, p. 953).

fundamental questions of governance. Should all types of automated transactions be enforceable? Should this be an ecology of purely private ordering? What values and structures will be built into these emerging dispute resolution mechanisms? What politics will the private legal engineers bring to these computational jurisdictions? Where in these ecologies is there room for sovereign intervention, and what form might it take? Calling them systems of private ordering conceptualises them as protective of individual freedom and the freedom of contract. Thinking of them as communal systems invites a public dimension and thus mechanisms for the protection of the public interest. There is accordingly a great deal at stake in how we characterise these systems and in the normative trajectory of their engineering.

## Legal Modules and Standardisations

Automated transactions on the internet are part of everyday life for many people. An automated transaction can be thought of as a means of exchanging value in which some dimension of the actual exchange is processed by a machine, without human intervention. However, the relationship between the computational mechanism that processes the exchange and the natural language contract that constitutes the agreement is not always clear. Smart contracts complicate this further because they are capable of more than simply processing payments. We are yet to see how this complexity will interface with existing legal systems. Further, how legal systems address the fact that smart contracts hosted on blockchains cannot be deleted or edited beyond the parameters of their code remains unresolved.<sup>2</sup> We argue that the resolution of these issues depends on how we conceptualise the novel modes of authorisation that are brought about by smart contracts. The entities actually producing the computational transaction systems and engineering their relationship to institutions of dispute resolution and enforcement are presently the agents deciding what forms of conduct are authorised and what forms of law are instituted. In many ways, these engineers are building the legal *standards* for engaging and transacting on these systems, and like many systems of standardisation, their authorising force is market dominance.

Standards are guidelines and protocols that ensure compatibility and interoperability between systems. Lawyers seem to think of standards as a technical question (Pagallo et al. 2017), whereas technicians think of standards as a ‘jurisdictional’ question (see e.g. Töngren et al. 2017). However, standards adopt the character of both, and should be thought of as hybrid techno-legal instruments. In any particular domain standards constitute a mosaic of rules that form the discrete regulatory *modules* to which private agreements refer. As regulatory modules, they structure patterns of action and behaviour into translatable packages that define the criteria for both technical interaction and legal transacting. Despite generally being created

<sup>2</sup> The autonomy of the contract means that funds can become inaccessible by anyone, or frozen, as it is called, if there is a mistake in handling the conditions of the contract. On parity multi-signature wallets freeze, see Choi (2017); see also Werbach (2018).

by private parties, market and infrastructural power relationships make the mandating of certain standards norm-generating and quasi-legislative. Indeed, whole ecosystems of private enforcement often orbit standardisation.<sup>3</sup> In many ways, the engineering of discrete computational transaction modules on blockchain platforms is a form of ‘legal standardisation’. This legal standardisation is not solely concerned with building legal protections into the technical architecture (Pagallo et al. 2017), but rather facilitating computational forms of *legal conduct*. Groups like the Enterprise Ethereum Alliance,<sup>4</sup> Mattereum (see e.g. the Mattereum White Paper, undated), Open Law (2017), Agrello (2017),<sup>5</sup> the R3 Consortium (2018), Common Accord (undated), and Legalese (2017–2018), in different ways, are building libraries of machine-readable transaction modules that correspond to natural language contracting elements. In doing so, they are creating the building blocks for ever more complex transactions that will ultimately define the entire envelope of computational legal conduct in these environments. However, it remains unclear to what extent these privately generated systems of conduct will produce systems of purely private ordering, or how their relationship to external normative systems might introduce more public considerations. An historical perspective may help understand the relationship of this form of private legal engineering to more complex systems of governance and dispute resolution.

In many ways, the emergence of legal environments on the blockchain echoes the systematisation of writs during the medieval period (Maitland 1889, p. 97). These early writs were technological artefacts that linked human conduct to the enforcement institutions of the courts.<sup>6</sup> They were not produced by judges, but by lawyers, who were engineering standards of legal exchange from the messiness of informal real-world interaction that would be readable through the writs issued by the King’s Court.<sup>7</sup> In the twelfth century a litigation between private parties would only come to the King’s Chancery if the parties were summoned by the King. The means for summoning were the fixed formulas, the writs (Maitland and Montague 1998, p. 99). As Mathew Hale describes in his history of the common law, after lawyers turn

<sup>3</sup> The role of standards in ‘private food law’ is a good example. See e.g. van der Meulen (2011). Van der Meulen describes how ecosystems of private enforcement orbit standardisation, with the food industry using certification marks, accreditation, auditing and arbitration as its enforcement arsenal.

<sup>4</sup> In particular, the Legal Industry Working Group. ‘The Legal Industry Working Group is focused on two primary objectives. The first objective is educating the legal industry about the benefits of blockchain technology for their profession. The second is the development and standardization of core ethereum enabled technology. We define “legal industry” at this point to primarily mean large global law firms and corporate in-house counsel.’ See The Legal Industry Working Group (undated).

<sup>5</sup> ‘Your agreement is translated to Agrello’s smart agreement markup language and reflected in a public blockchain. In parallel, a legally binding document, written in natural language, is created and digitally signed.’ Agrello (2017).

<sup>6</sup> See e.g. Dorsett and McVeigh (2012), where they describe the ‘technologies of jurisdiction’.

<sup>7</sup> Maitland says ‘There was no great need for a perfectly stereotyped uniformity; the fact that a writ was penned, and that it passed the seal, was not a fact that altered rights or secured the plaintiff a remedy; it still had to run the gauntlet in court, and might ultimately be quashed as unprecedented and unlawful.’ ... ‘Still, to return to my point, the granting of a newly worded writ was no judicial act; to grant one which could not be maintained was no act of justice; it might be a very proper experiment.’ Maitland (1889, p. 105).

customs into legitimate invocations of judicial authority, enforcement institutions shape their application:

First, The Common Law does determine what of those Customs are good and reasonable, and what are unreasonable and void. Secondly, The Common Law gives to those Customs, that it adjudges reasonable, the Force and Efficacy of their Obligation. Thirdly, The Common Law determines what is that Continuance of Time that is sufficient to make such a Custom. Fourthly, The Common Law does interpose and authoritatively decide the Exposition, Limits and Extension of such Customs. (Hale 1971)

Those early writs ultimately constituted the authoring of a library of engagements with the legal world—a library of legally acceptable transactions. As A.W.B. Simpson notes:

The medieval common law was a formulary system, whose content and basic structure were determined, to a very considerable extent, by the catalogue of original writs in the Register. In so far as it was possible to bring contractual actions in the common law courts, the possibility depended upon the existence of a suitable form of action. (1987, introduction)

To put it simply: no writ, no remedy—no remedy, no wrong (Maitland and Montague 1998, p. 99). Thus, the decision as to what is and what is not lawful behaviour depends on the available writs. The readability of legal reality became contingent upon one's ability to express it in the required form. The lawyer's job developed as the skill to translate physical temporal reality into the symbolic register of the writs.<sup>8</sup> And the legitimacy of the writ depended on its vindication by institutions of enforcement. While the forms of legal conduct on blockchain platforms are becoming clearer (i.e. smart contracts), the institutions of enforcement are not.

The contemporary exercise of engineering legally acceptable transactions is therefore authoring a library of possible engagements with the techno-legal world. The structures of contestation that will be implemented to address disputes over those transactions are critically determinative of the jurisdictional character of these systems. And the type of law that evolves, the type of transactions that are permitted and forbidden, and the procedures and structures of dispute resolution that are engaged, are all highly political (as well as technical) questions. Thus, the fundamental question becomes: who will be the 'oracles' of this hybrid techno-legal environment?<sup>9</sup> Dispute resolution, of course, can take many forms. It only means the final decision in a contestation. It can be brought about by unilateral decisions of governing entities, or it can be brought about by judicial intervention. But the technical and normative shape of those contestation mechanisms is yet to be determined.

<sup>8</sup> Maitland and Montague (1998, p. 101), where the authors note: 'He who knows what cases can be brought within each formula knows the law of England. The body of law has a skeleton and that skeleton is the system of writs.'

<sup>9</sup> See e.g. Dawson (1969), for a description of the role of adjudication in generating jurisdiction.

## Dispute Resolution Models and Norms

Although many purely computational dispute resolution mechanisms have been proposed (see e.g. Gurri 2014; Ast and Sewrjugin 2015; Abramowitzc 2015, p. 405; Clippinger and Bollier 2012; Koulu 2016, p. 40), in this short contribution we are more focused on questions of how computational conduct on blockchain platforms will be linked to traditional legal structures and institutions. It may be that the complex legal questions associated with moving transaction systems onto blockchains (i.e. what is the status of a smart contract that owns currency autonomously and beyond the reach of the judicial system?), as well as the geographic decentralisation of the transacting parties, make non-specialised national jurisdictions an unattractive option for dispute resolution. Accordingly, some have proposed using structures of transnational arbitration rather than national courts to overcome the lack of specialisation and choice of law problems (see e.g. the Mattereum White Paper undated); noting that arbitral decisions are enforceable in national jurisdictions on account of the New York Convention (Convention on the Recognition and Enforcement of Foreign Arbitral Awards 1958). However, replicating existing mechanisms of transnational law raises questions around the kind of normative order the combination of new standardised transaction modules and dispute resolution mechanisms might generate. Will these systems generate new bodies of *sui generis* rules and dispute resolution in the manner of international investment law? Or rather, deploy transnational arbitration mechanisms centred in, for example, English law, as is the case in commercial maritime disputes? Also important is what kind of limitations these dispute resolution bodies might impose on the possibilities of private legal exchange. If the legal engineers are building transaction modules that will drive pseudo-public infrastructures (as claimed will be the case by de Filippi and Hassan 2016), how will their normative parameters be established?

There is a second development in English legal history worth considering. The rigid system of the writs is said to no longer have been able to keep up with the social and economic changes in society, which subsequently led to the development of the Chancery as the court of equity (Maitland and Montague 1998, p. 101).

In the name of equity and good conscience they [the Chancery] had, as it were, been adding an appendix to the common law. Every jot and title of the law was to be fulfilled, and yet, when a man had done this, more might be required of him in the name of equity and good conscience. (Maitland and Montague 1998, p. 125)

This development partly rests on a normative basis, as a necessity for softer solutions and a more flexible law. However, there was also a brute monetary side to it. The adjudication of disputes brought income to the rivalling courts, so that they were not only seeking to complement the law, but equally to become the more attractive forum for disputes. The question of forum is not a mere technicality; it is a jurisdictional device that inaugurates the law (Dorsett and McVeigh 2012, p.

11). Jurisdiction ‘refers us first and foremost to the power and authority to speak in the name of the law’ (Rush 1997, pp. 144, 150). Thus, market logic as a parameter of forum-choice has significant implications for the kind of justice that will be delivered.

Another more recent field that has seen competition for different fora is that of international commercial arbitration (Dezalay and Garth 1998). The internationalisation of a novel legal field in this area also meant the escape from regulatory scrutiny of the nation states and has led to a form of ‘private justice’ (Dezalay and Garth 1998, pp. 7–8). A system of this kind is strongly characterised by the appointed arbitrators, their outlook onto the world and their political preferences. Arbitrators in commercial arbitration are said to be ‘selected for their “virtue”—judgment, neutrality, expertise’ (Dezalay and Garth 1998, p. 8), however the actual driving forces look different. As Dezalay and Garth put it:

The different methods and approaches for handling business disputes reflect a permanent tension between holders of economic power, who exert pressure to control the way their conflicts are handled, and a relatively small number of legal practitioners who seek to gain a large share of the lucrative market presented by commercial disputes. (Dezalay and Garth 1998, p. 8)

Dispute resolution on the blockchain is now emerging as a field of struggle of the same kind, with the same expectations of expertise in a certain group of individuals, as well as advantages in efficiency. The above-mentioned entities, Enterprise Ethereum Alliance, Mattereum, Open Law etc., are thus competing over the authority to shape the legal rules. In the same vein, national jurisdictions are competing to become the ‘Silicon Valley of the crypto economy’ (Werbach 2018, p. 40), again introducing market logic into their regulatory considerations. However, the theoretical and ethical propositions of the blockchain environment are still developing and there is a good amount of oral commitment to social justice through redistributive mechanisms on the part of some key players (see e.g. Adams et al. 2018; see also Levy 2017, p. 1). On the other hand, the libertarian element of the blockchain environment is likely to support arbitration mechanisms that are based more on individual freedom in the form of the interpretive priority of party consent, coupled with an ideal of efficiency.

## Conclusion

Given that any legal concept is indeterminate at its core, the context in which it will be interpreted and understood when contested is critical to the material legal reality in which it participates. Consider the difference between the private consent-oriented idea of *pacta sunt servanda* and the more public good-oriented idea of minimum mandatory provisions in e.g. labour or consumer protection law. Who would have the authority to impose the minimum in the latter case? How could the public affected by these novel techno-legal environments be conceptualised? What form of governance would be desirable around smart contracts? Questions of this kind are



political in nature and should be treated as such, instead of making them extensions of an ideology of efficiency.

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