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# Robots Replacing Arbitrators: Smart Contract Arbitration

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**Dispute resolution is already robotised to some extent. Various forms of information technology ('IT') tools, including artificial intelligence ('AI'), are currently used in arbitration. This article explores how technology can be further integrated in dispute resolution, especially in the context of 'smart contracts', and the benefits or threats of automated procedures and decision making.**

## Introduction

The consensual nature of alternative dispute resolution allows the parties and their counsel a wide margin of appreciation when designing the arbitration process. This also applies to the use of IT tools, as there are no particular limitations to the use of technology throughout the dispute resolution process.

Several provisions demonstrate that procedural management is essentially consensual. For instance, Article 19 of the UNCITRAL Model Law on International Commercial Arbitration allows the parties to 'agree on the procedure to be followed by the arbitral tribunal' and provides that, failing such agreement, the arbitral tribunal may 'conduct the arbitration in such manner as it considers appropriate'. As for an institutional example, Article 19 of the ICC Rules provides that 'where the Rules are silent' the proceedings shall be governed 'by any rules which the parties or, failing them, the arbitral tribunal may settle on'.

In relation to fact-finding, arbitrators may also exercise their discretion and use – and benefit from – IT tools. The UNCITRAL Model Law (Article 19(2)) provides that the tribunal has the power to 'determine the admissibility, relevance, materiality and weight of any evidence'. Similarly, institutional arbitration rules give arbitrators broad discretion in establishing the facts of the case.[1] Article 25 of the ICC Arbitration Rules adds a general time-frame to the process by providing the following:

> The arbitral tribunal shall proceed within as short a time as possible to establish the facts of the case by all appropriate means.

This general time-frame 'as short a time as possible' and the introduction of expedited proceedings show that arbitral institutions may benefit from new technologies which can reduce the length of proceedings and costs, and make arbitration more accessible to a wider range of potential users. Conducting case management online, having hearings over video conferencing and further digitalising the process would make arbitration more appropriate for small-value disputes.

Going further, Article 20(2) of the 2014 ICDR Arbitration Rules (International Centre for Dispute Resolution) not only allows but encourages the use of technological tools as follows:

> In establishing procedures for the case, the tribunal and the parties may consider how technology, including electronic communications, could be used to increase the efficiency and economy of the proceedings.

A number of tools already exist for handling a large amount of data. The 'LegalTech' sector, an aggregate term for start-ups providing software for legal services, such as discovery of electronically stored information ('e-discovery'), online case management, storage and data processing, has many advantages for players in the arbitration market as this software can assist counsel in document management and reduce the risk of human errors at various stages of discovery.[2] Technologies relied on by LegalTech include the following:

- *Big data*, as the name suggests, allows storing and working with massive volumes of information that cannot be processed in traditional databases.

1 Similarly, institutional arbitration rules give arbitrators broad discretion in establishing the facts of the case, see Article 29 of the 2018 VIAC Arbitration Rules, Article 31 of the 2017 SCC Arbitration Rules and Article 22 of the 2013 HKIAC Arbitration Rules.

2 For a contextual example, see 'Israeli AI software whips expert lawyers in contract analysis', The Times of Israel, 26 February 2018.

- *Natural language processing* consists of techniques 'for analyzing and representing naturally occurring texts at one or more levels of linguistic analysis for the purpose of achieving human-like language processing'.[3]
- *Blockchain technology* is a digital, distributed ledger allowing for the transfer of property or information without the use of an intermediary. Blockchain technology is based on a peer-to-peer relationship and ensures the traceability and immutability of all operations; it allows highly secure transactions and is at the root of the development of smart contracts. In particular, Blockchain provides a platform for Bitcoin transactions.
- *Machine learning technology*, which has led to the development of predictive justice, can provide a range of probabilities of success of a dispute or of separate claims. Most sophisticated programs can also analyse judges' behaviour and predict their propensity to grant or deny specific motions and claims.[4] This technology can also assist both counsel and arbitrators in the search of relevant legal precedent and help lawyers in the preparation and implementation of their case strategy, including within potential settlement discussions.

This article will explore the development of smart contracts triggered by the *blockchain technology* (I), the likely rise of smart contracts and automated arbitration (II) as well as the possible legal restrictions (III).

## I. The development of smart contracts

Smart contracts can rely on input from an external source, called an 'oracle', which will trigger a particular contractual outcome. The oracle is an agent tasked with finding and verifying real-world events. There is no reason why this 'oracle' could not be an arbitral tribunal, or even a robot programmed to resolve disputes. After describing how smart contracts function (a), we will discuss the specific types of disputes that are likely to arise in relation to these contracts (b).

### a) What are smart contracts?

The term 'smart contract' generally refers to 'self-executing electronic instructions drafted in computer code', using *blockchain technology* as a platform.[5] Smart contracts cover a range of scenarios, from a contract entirely written in code – reminding us of the expression 'code is law' where a computer code, rather than legal norms, structures relations between parties –,[6] to a contract where only some contractual terms are automated, such as payment terms.

Not all 'smart contracts' are contracts in the legal sense. Indeed, whether a smart contract is considered a legally binding agreement depends on the contract law of each jurisdiction as well as the particularities of each smart contract.[7] For the purpose of this article, we will only consider smart contracts that are legally binding.

Smart contracts profoundly alter legal transactions, since electronic instructions will self-execute on the basis of predetermined conditions being registered in the blockchain. Self-execution can reduce disputes arising from transactions as well as the risk of human errors. For example, in the context of an options contract encoded into a blockchain, the promisor remains anonymous and the contract can be assigned to any other person. When the triggering event occurs, such as a strike price, the contract self-executes according to the encoded terms without the instructions of a centralised body.

Smart contracts function according to an 'if – then' logic, enabling the self-execution of payments or the release of funds once certain predetermined conditions are fulfilled. Insurance contracts, escrow agreements, and royalty distribution contracts already inherently

3 E. D. Liddy, 'Natural Language Processing' in *Encyclopedia of Library and Information Science* (New York: Marcel Decker, Inc., 2001).

4 'AI predicts outcomes of human rights trials', University College London, 24 October 2016, available at http://www.ucl.ac.uk/news/news-articles/1016/241016-AI-predicts-outcomes-human-rights-trials.

5 R. O'Shields, 'Smart Contracts: Legal Agreements for the Blockchain' (2017) 21 *NC Bank. Inst.* 177 at 179.

6 See L. Lessig, 'Code is Law: On Liberty in Cyberspace' (2000) *Harvard Magazine*, available at https://harvardmagazine.com/2000/01/code-is-law-html (last accessed on 29 November 2017).

7 For instance, in early 2017, Arizona passed House Bill 2417, which defines a smart contract as an 'event driven program, with state, that runs on a distributed, decentralized, shared and replicated ledger that can take custody over and instruct transfer of assets on that ledger' and provides that 'a contract relating to a transaction may not be denied legal effect, validity or enforceability solely because that smart contract contains a smart contract term'. In clarifying the definition of the term 'smart contract' and clarifying their legal effect, the bill may reduce hurdles to enforcing smart contracts as legally binding agreements in the state of Arizona. The text of the bill can be accessed at https://legiscan.com/AZ/text/HB2417/id/1588180 (last accessed on 14 February 2018).

follow this 'if – then' logic.[8] In the case of an escrow agreement, funds are held on a distributed ledger; upon the occurrence of a predetermined event, the smart contract verifies the fulfillment of necessary conditions and *then* performs the stated contractual action, be it the release of a certain amount of the funds held in escrow or the release of a bearer certificate.[9] In the case of an insurance contract, the smart contract would self-execute claims payments without the insured party having to fill out a request, which would be particularly useful in cases where a company may have to deal with hundreds of claims at once. In the finance sector, smart contracts can facilitate the issuance of securities to investors directly, facilitate data recording among parties to a transaction, and update prices to reflect market prices.[10]

Smart contracts are particularly useful in facilitating transactions where trust in existing institutions and intermediaries is lacking. For instance, smart contracts can provide a useful substitute when the contractual performance depends on the action of a bank or government official in a foreign country in which the beneficiary lacks trust. In this scenario, smart contracts enable transactions that would otherwise not occur, the 'blockchain' architecture being considered as 'trustless trust' architecture.[11]

### b) Disputes resulting from the use of smart contracts

Although smart contracts can reduce the potential for disputes between contracting parties due to the blockchain's 'trustless' and self-executing characteristics, potential disputes still exist, in particular those related to human errors in the creation or implementation of smart contracts.

At the outset, the idea of human errors in the context of smart contracts may be counterintuitive since one of the main benefits of smart contracts is the lack of human intervention during the contract's performance. However, an individual will still have to write the initial code in order to create, or 'draft', the smart contract.

Any mistake in or incompleteness of the code during contract creation will impact the performance of the contract, as illustrated below.

First, smart contracts often involve long and complex coding terms which imply a risk of error. Such errors could in turn lead to incorrect or unexpected results and involve bugs relating to timestamps or the transaction orders. Ensuring correct transaction orders is particularly important in online market places where prices are frequently updated and users send instantaneous purchase requests, and where the supply and demand ratio affects the purchase price.[12]

The so-called 'DAO attack' provides an illustration of the consequences of erroneous code being exploited by users. The DAO (Decentralized Autonomous Organization) can be described as the 'blockchain way of creating a company'.[13] This particular DAO was built using a smart contract in the 'Ethereum' blockchain, one of the platforms that provides blockchain technology, and was created to allow crowdfunding of projects in the blockchain. Users would buy DAO tokens with 'Ethers', the digital currency provided by Ethereum, and fund the projects they like. If the project was successful, the DAO would allow the token holders to withdraw the profits they had made from the investments. However, one user noticed that this function enabled a continued withdrawal of funds *before* updating user balances and totals. Taking advantage of this error, the user was able to withdraw 60 million dollars' worth in cryptocurrency. The glitch detected in the DAO shows how unforgiving an error in code can be. The creator of the DAO explained the error and the consequential exploit as follows:

> [I]f the capital "T" in line 666 of the code had been a small "t", that would have also prevented the hack.[14]

The situation the coding community faced after this attack demonstrates that solutions proposed by traditional contract law for unforeseeable events may not be easily applicable to smart contracts.[15] Indeed,

8 See Chamber of Digital Commerce (Smart Contract Alliance in Collaboration with Deloitte), 'Smart Contracts: 12 Use Cases for Business & Beyond, A Technology'(2016) Legal and Regulatory Introduction, available at https://digitalchamber.org/wp-content/uploads/2018/02/Smart-Contracts-12-Use-Cases-for-Business-and-Beyond_Chamber-of-Digital-Commerce.pdf (last accessed on 11 December 2017).

9 Ibid.

10 Ibid.

11 Werbach, Kevin D., 'Trust, But Verify: Why the Blockchain Needs the Law' (2017). *Berkeley Technology Law Journal*, Forthcoming. Available at SSRN: https://ssrn.com/abstract=2844409

12 L. Luu, D.-H. Chu, H. Olickel et al., 'Making Smart Contracts Smarter' CCS '16 Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security, 254, available at https://dl.acm.org/citation.cfm?doid=2976749.2978309 (last accessed on 15 February 2018).

13 M. Leising, 'The Ether Thief' (2017) *Bloomberg*, available at https://www.bloomberg.com/features/2017-the-ether-thief/ (last accessed on 11 December 2017).

14 Leising, supra, note 13.

15 It is worth noting, however, that smart contracts could reach a higher degree of sophistication and thus offer various solutions to the problem of incomplete foresight, such as a fallback contract or a superset of rules that would prevail in a given scenario.

in weighing the options to undo the theft, members of the Ethereum community found it difficult to reconcile the principle of immutability of the blockchain and the practical need to recover the funds. Eventually, they decided to change the Ethereum blockchain in order to fix the DAO (referred to as a 'hard fork'[16]), a solution which could be assimilated to contract revision but which was met with significant resistance from Ethereum users who found this solution incompatible with the fundamental values of blockchain.[17]

An often-cited example of a relatively straightforward smart contract is a contract for flood insurance where claim payments to insured are automatically made when rainfall reaches a certain threshold. In such a case, the parties to the contract determine in advance which weather service, or oracle, supplies the data, as well as an alternative provider in case the first is no longer available.[18] Ideally, the insurance contract would automatically make the claimed payments when the oracle provides data of rainfall reaching the determined threshold. However, inaccurate information could fail to trigger a payment that is due or trigger an invalid payment. In such cases, legal recourse would be necessary to remedy the situation, for example on the basis of unjust enrichment.

Second, individuals writing code for smart contracts may not be the same as those negotiating or drafting the contents of the contract, creating a risk of discrepancies between the natural language of the contract and its coded version. This could lead to disputes relating to which version should prevail. It should be noted that for smart contracts partially or entirely written in code, there is an open question regarding contract interpretation since usual standards such as 'the reasonable person' would be difficult to apply.

The third potential source of difficulties lies in subjective concepts that, for now, cannot be translated into code, such as the principle of good faith or 'reasonableness'. Directly transposing traditional contract law to smart contracts may not be the solution because smart contracts seem to be sui generis contracts, with their own specificities. As in traditional contracts, smart contracts may provide for sanctions in case of non-execution by one party; however, unlike traditional contracts, these sanctions are to be automatically implemented rather than being subject to external decision. For example, in a car 'smart lease', a payment would grant the lessee access to the car, and non-payment would block access by locking the car door.

Automatic sanctions are subject to debate. Besides the party's right to contest a sanction that seems unfair, an issue is whether an automatic sanction would be legally valid in the first place.[19] In the example of a 'smart lease' mentioned above, blocking the lessee's access to the car until payment is made would amount to withholding performance of the contract, as recognised in many jurisdictions. However, a common principle in many legal systems is that performance can only be withheld if the breach is sufficiently serious.[20] As mentioned above, because subjective concepts cannot yet be translated into code, it would be difficult for the smart contract to execute the sanction in accordance with contextual principles, such as 'significant' or 'reasonable'.

Other specific protections against the automatic implementation of sanctions, such as consumer protections, may also prevent use of such features in certain domains. For instance, English law, like many other legal systems, provides special protections to consumers entering into contracts with traders. In particular, according to the Consumer Rights Act 2015 (CRA), 'unfair' contractual terms are not binding on consumers. Under the CRA, a term is 'unfair' if it is 'contrary to the requirement of good faith, it causes a significant imbalance in the parties' rights and obligations under the contract to the detriment of the consumer'.[21] As a result, a clause in a consumer smart contract (offered by a bank, for instance) that

16 A hard fork 'relates to blockchain technology, and is a radical change to the protocol that makes previously invalid blocks/transactions valid (or vice-versa). This requires all nodes or users to upgrade to the latest version of the protocol software. Put differently, a hard fork is a permanent divergence from the previous version of the blockchain and nodes running previous versions will no longer be accepted by the newest version. This essentially creates a fork in the blockchain: one path follows the new, upgraded blockchain, and the other path continues along the old path. Generally, after a short period of time, those on the old chain will realize that their version of the blockchain is outdated or irrelevant and quickly upgrade to the latest version', https://www.investopedia.com/terms/h/hard-fork.asp#ixzz5CjvwT54o

17 Leising, supra, note 13.

18 See Chamber of Digital Commerce (Smart Contract Alliance in Collaboration with Deloitte), supra n.8

19 R. Koulu, 'Blockchains and Online Dispute Resolution: Smart Contracts as an Alternative to Enforcement' (2016) 13 *Scripted* 40 at 54, available at https://script-ed.org/article/blockchains-and-online-dispute-resolution-smart-contracts-as-an-alternative-to-enforcement/.

20 This is the case, for instance, in Ibero-American systems of law, as well as in French law, through the *exception d'inexécution*, or defence of non-performance. According to Article 1219 of the French Civil Code, the right to withhold performance may only be exercised under certain conditions, including non-performance of a sufficiently serious nature; it is left to the judge to decide *ex post facto* whether this non-performance was sufficiently serious, and whether the *exception d'inexécution* was used in good faith.

21 English Consumer Rights Act 2015, Section 64(2): In the case *OFT v First National Bank*, an example of a significant imbalance cited by the House of Lords was a term granting the trader undue discretion or imposing a disadvantageous burden on the consumer. See *Director General of Fair Trading v First National Bank* [2001] UKHL 52.

included automatic sanctions in case of non-execution by the consumer could be considered to create a significant imbalance and may not be enforceable under English law. A smart contract may also violate other policy norms, such as data protection law or currency controls.

New regulations are likely to emerge and quickly evolve in an attempt to fill gaps. One example is the recent recognition of the use of blockchain technology in the context of financial instruments under French law. Since 2016, the French Monetary and Financial Code has allowed for the issuance and assignment of certain interest-bearing notes ('minibons') using blockchain technology.[22] The registration of the assignment operation in a blockchain constitutes the written agreement which is typically required for the assignment of debt under French law.[23] As blockchain technology is for now limited to this particular context in French law, it remains to be seen how these provisions will evolve in the future, and whether other applications will be recognised by French legislation. Precisely because of these likely regulatory changes, flexibility is needed within dispute resolution in order to adjust to evolving law.

## II. The rise of smart contract arbitration

Given the large variety of disputes that may arise in relation to smart contracts, the parties will need a suitable forum to settle them. International arbitration presents a number of advantages for smart contract disputes (a). There are different forms of arbitration that may be considered, traditional 'off-chain' arbitration (b) and robotised 'on-chain' arbitration (c).

### a) Benefits of smart contract arbitration

Arbitration appears well-suited to smart contracts primarily because arbitration and smart contracts share many common features. Both operate in a decentralised manner. International arbitration is delocalised, meaning it is detached in many respects from the constraints of national laws. For instance, French courts have held that international arbitral awards are not part of any national legal order and that they constitute decisions of international justice.[24] This feature is particularly important since smart contracts are built into a distributed ledger, and assigning location to traditional contractual elements, such as place of performance, may be difficult or impossible. In addition, parties to a smart contract may be located in different parts of the world, thereby potentially creating various conflicts of jurisdiction which an arbitration agreement would circumvent.

Both smart contracts and arbitration are flexible. Procedural flexibility is one of the most valuable aspects of arbitration proceedings. This feature distinguishes arbitral proceedings from domestic litigations that often have rigid procedural rules in which parties do not have a say on who will adjudicate their disputes. As technical issues require specific insights and expertise, parties to an arbitration will be able to appoint suitable arbitrators and tailor their proceedings to meet these specific requirements.

Confidentiality of proceedings is another feature of arbitration which may be valuable for smart contract disputes, particularly for smart contracts hosted on 'permissioned' (private) ledgers. In contrast with 'permissionless' (open) ledgers, permissioned ledgers subject participants to pre-selection or to gated entry upon satisfaction of certain requirements or approval by an administrator.[25] Though most jurisdictions do not expressly provide for a duty of confidentiality surrounding the arbitral process, most commentators agree that some general duty of confidentiality is implied in an arbitration agreement,[26] and parties could expressly include a duty of confidentiality in their arbitration agreement.

Another attractive feature of arbitration for disputes where enforcement is needed outside of the blockchain is that most jurisdictions provide for facilitated enforcement of international arbitral awards. This procedure is subject to few requirements and to minimum oversight of national courts as per the 1958 New York Convention on the Recognition and

22 French Monetary and Financial Code, Article L.223-12: Blockchain technology is referred to as a 'shared mechanism of electronic recording which allows the authentication of these transactions, within security conditions'. These security conditions are to be defined in a future decree by the Conseil d'Etat.

23 French Monetary and Financial Code, Article L.223-13. See Articles 1321 and 1322 of the French Civil Code for the requirements relating to the assignment of debt.

24 See e.g., French Court of Cassation, Civ. 1, 29 June 2007, n° 05-18.053.

25 See Chamber of Digital Commerce (Smart Contract Alliance in Collaboration with Deloitte), supra n.8.

26 'Chapter 20: Confidentiality in International Arbitration' in G. B. Born, *International Commercial Arbitration* (Kluwer Law International, 2014) 2779 at 2785.

Enforcement of Foreign Arbitral Awards.[27] Currently, 157 countries are party to the convention,[28] meaning that even where an award concerns multiple parties in several of these countries, enforcement in each jurisdiction is relatively simple.

Finally, both international arbitration and blockchain-based transactions are intended to create a common trust architecture that transcends national laws and courts. This common trust architecture facilitates transactions that may not otherwise have been possible due to the parties' lack of trust in traditional institutions and intermediaries.

### b) Off-chain (traditional) arbitration

It is obviously possible for the parties to smart contracts to resort to 'traditional' arbitration, which may be institutional or *ad hoc*.[29] Although the arbitral institutions would be particularly suitable for high-value smart contract disputes, most arbitral institutions do not appear to be yet equipped to handle low-value disputes. Given the specificities of this sector, it might be helpful to draft arbitration rules specifically for smart contracts (and for instance, provide for more digitalisation of the arbitral process to lower costs), and compile a list of arbitrators who have the necessary expertise.

'Off-chain' dispute resolution may also take the form of ad hoc arbitration governed by the UNCITRAL Arbitration Rules or the rules of a trade association for example. With time, a specific set of procedural rules for smart contract disputes may develop, but in the meantime an advantage of *ad hoc* arbitration for smart contract disputes may be that parties can choose tailor-made rules or modify an existing set of rules as they see fit.

The arbitral decision could then be registered on a blockchain. Here, the arbitral tribunal would act like an oracle, providing the input for action by smart contract, and permitting a self-executing arbitral decision.

### c) On-chain (robotised) arbitration

In some cases, the blockchain platform used for the transaction may have a central administrating authority for arbitrating disputes. Parties could either agree to this kind of arbitration by smart contract or the terms and conditions of the platform could include an arbitration agreement. A key advantage of on-chain arbitration would be its integration within the disputed smart contract in a blockchain, making it easier to pause the transaction if necessary or to eventually administer remedies. An algorithm could resolve the dispute based on the analysis of similar transactions and disputes.

Alternatively, on-chain arbitration could take the form of delocalised adjudicative proceedings, where human individuals join a blockchain and are included in a pool of potential arbitrators. They could be selected either by the parties to the dispute or by an algorithm itself on the basis of a predefined mechanism. Once the panel is constituted, they will receive the evidence or data from the parties to the dispute, and have a limited timeframe to render a decision on that basis. This decision would then be incorporated into the blockchain, and automatically executed by the smart contract.[30]

## III. Legal restrictions to robotised arbitration

The current legal framework does not appear to allow fully robotised arbitration. There are constitutional limits (a), as well as legal challenges at the stage of enforcement of the decision in on-chain arbitration (b) and enforcement of the award in off-chain arbitration (c).

### a) Constitutional considerations

Robotised arbitration raises many issues, including whether this type of dispute resolution constitutes a proper system of justice, as currently understood by constitutions and human rights conventions.

27 According to Article V, recognition or enforcement may only be refused in the following cases, which must be proven by the respondent: lack of a valid arbitration agreement, violation of due process, excess of the arbitral tribunal's authority, irregularity in the composition of the tribunal or the arbitral procedure, and the award has been set aside or suspended in the country where it was made. Two final grounds which a court may raise on its own motion include the case where the subject matter is not capable of settlement by arbitration under the law of that country ('arbitrability') or where recognition/enforcement would be contrary to the public policy of that country.

28 See UNCITRAL, Status – Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York, 1958), available at **http://www.uncitral.org/uncitral/en/uncitral_texts/arbitration/NYConvention_status.html** (last accessed 29 November 2017).

29 Ethereum website suggests including arbitration clauses for potential disputes, available at **http://ethereumlabs.com/dispute-resolution/** (last accessed on 14 February 2018).

30 This mechanism already exists with the newly created Kleros court. For more information, see C. Lesaege and F. Ast, 'Kleros White Paper' (2018), available at **https://kleros.io/assets/whitepaper.pdf** (last accessed on 15 February 2018).

For some scholars, justice must necessarily be human:

> [H]uman judgement is constitutive of the system of justice. That is, if any system of justice is to apply to humans, then it must rely upon human reason. Justice itself cannot be delegated to automated processes. While the automation of various tasks involved in administrative and legal proceedings may enhance the ability or efficiency of humans to make their judgements, it cannot abrogate their duty to consider the evidence, deliberate alternative interpretations, and reach an informed opinion. Most efforts at automating administrative justice have not improved upon human performance, in fact, but have greatly degraded it. To automate these essential aspects of human judgement in the judicial process would be to dehumanize justice, and ought to be rejected in principle.[31]

One could however argue that the code programming a contract or a decision is in fact written by humans.

Another question is whether a robotic system of justice (and robotic arbitration) might coexist in parallel with the 'traditional' system of justice. An analogy could be made with ecclesiastical justice that has developed a separate system of law for which the clergy is the enforcement body. The ecclesiastical system therefore exists in parallel to state justice, as widely recognised for instance by the European Court of Human Rights which has repeatedly held that ecclesiastical justice is valid as long as it respects the procedural requirements of fair trial under Article 6 of the European Convention on Human Rights.[32]

### b) Award enforcement in on-chain arbitration

A decision made in the blockchain can be self-enforced. The decision may not necessarily be challenged before national courts because the blockchain community would accept to deal with disputes exclusively on-chain. A parallel can be drawn between on-chain arbitration and professional guilds. A study by Lisa Bernstein, professor of law at the University of Chicago, illustrates how private dispute resolution operates in professional guilds (using the example of the diamond industry) and how internal systems involve swift decisions, with no communicated reasons and no procedures for internal appeal. When a member of the guild does not comply with the decision of the guild, this decision is published within diamond markets, and the member can be excluded from trading, an extraordinarily severe sanction. Internal enforcement is sometimes much more effective than a recourse to courts.[33] A blockchain community using smart contracts is like these diamond merchants who 'opt out of the legal system' for their transactions, and for dispute resolution.[34]

However, there are due process limits even within purely private dispute resolution arrangements. Under consumer protection laws, an individual will generally retain the right to bring a dispute before the national court system, even if he or she has agreed to arbitration. Moreover, if a private dispute resolution system results in a party losing a fundamental right, such as freedom of expression, courts will step in to ensure that due process is respected.[35]

An example of automatic 'on chain' enforcement, with no external enforcement actions is the process used by social media to remove harmful content. Although, the process may be based in part on artificial intelligence, trained to detect nudity, copyright infringement or fake news, most social media have human reviewers and appeal procedures. The sanction for harmful content is content removal or account termination, in accordance with the terms of use. However, this automatic sanction notably led to a lawsuit brought by a Facebook user whose account was terminated because he posted Gustave Courbet's painting 'The Origin of the World'.[36] This example further illustrates the robot's current lack of subjective assessment.

The European General Data Protection Regulation ('GDPR') protects individuals against automatic decision-making that produces legal effects, giving individuals the right to opt-out, the right to receive 'meaningful information about the logic involved',[37] and the right to 'obtain human intervention on the part of the controller, to express his or her point of view and to contest the decision'. Such GDPR principles provide guarantees with regards to robotic decisions creating legal effects and could also apply by analogy to robotised arbitration.

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31 P. Asaro, 'On banning autonomous weapon systems: human rights, automation, and the dehumanization of lethal decision-making' (2012) 94 *Int'l Rev. of the Red Cross* at 701.

32 See, e.g. *Pellegrini v Italy*, 20 July 2011, Application No. 30882/96, para. 47; *Karoly Nagy v. Hungary*, 14 September 2017, Application No. 56665/09.

33 See L. Bernstein, 'Opting Out of the Legal System: Extralegal Contractual Relations in the Diamond Industry' (1992) 21 *J. Legal Stud.* 115 at 128-30.

34 Ibid.

35 H. P. Monaghan, 'First Amendment "Due Process"', (1970) 83 Harvard L. Rev. 518.

36 P. Signoret, 'Facebook : la justice se penche sur la censure de «L'Origine du monde» (2018) *Le Monde*, available at http://www.lemonde.fr/pixels/article/2018/02/01/censure-de-l-origine-du-monde-sur-facebook-une-attaque-contre-la-democratie_5250611_4408996.html (last accessed on 1 March 2018).

37 Article 13-2(f), Regulation (EU) 2016/679.

### c) Award enforcement in off-chain arbitration

There appear to be more challenges in relation to robotised arbitration when the enforcement of the decision is sought off-chain, i.e. before national courts. Enforcing machine-generated arbitral decisions through national courts currently appears unlikely given that the process does not follow basic requirements regarding the composition of the arbitral tribunal (i) and the form and content of the award (ii).

#### (i) Composition of the tribunal

To the authors' knowledge, no legal system expressly provides for robots or computer code serving as arbitrators. While some countries specify that the arbitrator has to be a physical person (such as Peru, Brazil and Ecuador), most arbitration statutes do not really address this question (e.g., Federal Arbitration Act in the United States and the English Arbitration Act of 1996).[38] French law, for example, requires an arbitrator to be a physical person in domestic arbitration, but is silent regarding international arbitration.[39] Similarly, the UNCITRAL Model Law on International Arbitration and its 'travaux préparatoires' do not provide a specific definition of an arbitrator.[40]

Where there is no express requirement as to the status of the arbitrator, it would theoretically be legal for a machine to perform this function.[41] However, the arbitrator should have legal capacity as a natural or legal person, which is currently not the case for a robot. A robot arbitrator would therefore not have an existence of its own, but would have to be linked to the existence of a legal entity or an individual, presumably the robot's owner or administrator. Consequently, it would not be possible to name a given system as an arbitrator. Instead, the arbitrator would be the person or entity controlling the AI system.

Almost all national arbitration statutes, as well as institutional rules, provide for the duty of independence and impartiality of the arbitrator. Machines may be well-suited to demonstrate impartiality and independence from the parties. This could be programmed into the AI system, and would be easier to verify than for a human arbitrator, who may not always be aware of his or her own subtle partiality.

Although courts have not yet decided on the issue of robotised arbitration, a US Court did decide on the value of a decision taken by a judge on the basis of information processed by a computer. Is the arbitrator still making an independent decision, or is he or she simply rubber-stamping a machine-made decision? A Court in Wisconsin (USA) decided on a case where the judge used a tool to predict the probability that a given individual, Mr Loomis, would become a recidivist.[42] The Wisconsin Supreme Court found that the judge used the tool for information, but that he made an independent decision regarding what sentence was appropriate for that individual. However critics argue that the *Loomis* decision did not adequately address the problem of judges' increasing reliance on AI tools:

> Research suggests that it is challenging and unusual for individuals to defy algorithmic recommendations.[43]

Human arbitrators or judges may therefore give undue weight to machine-generated results, on the assumption that machines have access to more information than human judges do, so their decisions must be better.

#### (ii) Form and content of the award

Currently, it would be difficult for a decision rendered by a machine to be qualified as an award according to national laws, and this would impact its recognition and enforcement internationally. Under French law, the award has to be signed by the arbitrators, which raises once more the issue of the arbitrator's legal personality.[44] However, as explained above, the signatory of the award could also be the organisation that is responsible for the robot. For example, a robotised arbitration decision issued by ICC could be signed either by an individual in his or her capacity as administrator of the 'ICC's AI dispute system', or by ICC itself. The responsibility for the award, and its signature, would lie with the administrator of the system, not with the system itself.

38 J. M. de la Jara, A. Infantes and D. Palma, 'Machine Arbitrator: Are We ready?' (2017) *Kluwer Arbitration Blog*, available at http://arbitrationblog.kluwerarbitration.com/2017/05/04/machine-arbitrator-are-we-ready/ (last accessed on 14 February 2018).

39 See Article 1452 of the French Code of Civil Procedure for domestic arbitration. Professor Thomas Clay suggests that this would allow a legal entity to act as an arbitrator in international arbitration. See T. Clay, *Code de l'arbitrage commenté* (Paris: LexisNexis, 2015) at 57.

40 G. Vannieuwenhuyse, 'Arbitration and New Technologies: Mutual Benefits' (2018) 35 *J. Int. Arb.,* 119 at 125.

41 See J. M. de la Jara, A. Infantes and D. Palma, supra n.38

42 *State v. Loomis*, 881 N.W.2d 749 (Wis. 2016); see also, F. Pasquale, 'Secret Algorithms Threaten the Rule of Law' (2017) *MIT Technology Review*.

43 *State v. Loomis*, (2017) 130 Harv. L. Rev. at 1530.

44 Article 1513, French Code of Civil Procedure: 'In the silence of the arbitration agreement, the award is rendered by majority. All arbitrators shall sign the arbitral award. However, if a minority of arbitrators refuse to sign it, the president specifies this in the award signed by him alone (...)'. (free translation).

French law also requires an award to state reasons (article 1482 of the Code of Civil Procedure, which also applies to international arbitration unless parties provide otherwise). Similarly, the UNCITRAL Model Law in its article 31(2) states:

> The award shall state the reasons upon which it is based, unless the parties have agreed that no reasons are to be given or the award is an award on agreed terms.

If the code simply produces a solution to the dispute, particularly if it is a self-executing blockchain arbitration, this would potentially violate the reasoning requirement. Many AI systems raise problems of accountability because their decisions are not explainable, and therefore cannot be evaluated *ex post*, which raises a fundamental problem of legitimacy and trust for AI systems:[45]

> Some systems adjudicate in secret, while others lack recordkeeping audit trails, making review of the law and facts supporting a system's decisions impossible.[46]

However, as explained in the previous section on on-chain arbitration with the example of dispute resolution within the diamond industry, decision-makers are not always required to give reasons for their decisions. Indeed, the parties can in some cases waive the requirement of reasoned decisions. However, human arbitrators are accountable in other ways. They are selected and confirmed because they are trusted. Poor decisions will hurt the arbitrator's reputation, leading to the arbitrator's exclusion from future arbitrations. Machines do not have a reputation to defend, but their administrators do. One can imagine that an arbitral institution would suffer an enormous reputational cost if it provided an AI-based arbitration system that was not trustworthy and accountable. This will likely require systems whose decisions can be audited and scrutinised, rather than systems that simply produce a black-box result.

Human arbitrators are not always able to explain exactly why they reached a certain decision.[47] Some elements of the decision-making are intrinsically linked to the arbitrator's experience or ethical and cultural background, and cannot be entirely identified. However what society can tolerate in human decisions does not necessary apply to machine-generated decisions, where the need for accountability and trust is higher.

## Conclusion

Fully robotised arbitration may be suitable for certain kinds of disputes, particularly those involving reoccurring transactions, and would benefit low-value cases as online dispute resolution reduces costs. When the decision requires no enforcement through national courts, the procedure would face fewer procedural constraints. However, an arbitration award needs to comply with many procedural requirements in order to be recognised in one or several states. Because robots – AI systems – do not (yet) have legal personality, the arbitrator can today only be an individual or a legal entity. The ability of AI systems to produce reasons for their decisions will be essential for trust and accountability. Where fundamental rights are at stake, purely machine-generated justice will likely remain impossible for constitutional and ethical reasons, because 'human judgement is constitutive of the system of justice'.[48]

However, AI systems may make for good experts. In expert determination proceedings, which can be administered by the ICC, LCIA and WIPO,[49] the parties may agree that the determination by the expert will be binding, but it does not rise to the level of court-like adjudication and does not benefit from facilitated recognition and enforcement contrary to arbitration. As such, it does not require the same procedural guarantees.

Expert determination is already widely used for technical disputes, such as gas or share price determination and construction schedule disputes. An AI system could act as expert to resolve factual issues, such as whether a contract performance complied with technical specifications, to calculate the market value of shares or commodities, or to calculate damages. Procedural guarantees of the 'on-chain' expert determination could be ensured by 'traditional' arbitration for disputes following the decision rendered

45 'For artificial intelligence to thrive, it must explain itself?' (2018) *The Economist*.

46 D. K. Citron, 'Technological Due Process' (2008) 85 *Wash. U. L. Rev*. at 1253.

47 V. Pande, 'Artificial Intelligence's 'Black Box' is nothing to fear' (2018) *New York Times*, available at https://www.nytimes.com/2018/01/25/opinion/artificial-intelligence-black-box.html (last accessed on 14 February 2018).

48 P. Asaro, 'On banning autonomous weapon systems: human rights, automation, and the dehumanization of lethal decision-making'(2012) 94 *Int'l Rev. of the Red Cross* at 701.

49 See ICC Expert Rules 2015, available at https://iccwbo.org/publication/icc-expert-rules-english-version (last accessed on 15 February 2018); WIPO Expert Determination Rules 2016, available at http://www.wipo.int/amc/en/expert-determination/rules/ (last accessed on 15 February 2018). LCIA does not have a specific set of expert determination rules, but the institution commonly administers such proceedings. See LCIA, 'Experts in International Arbitration' (2018), available at http://www.lcia.org/News/experts-in-international-arbitration.aspx (last accessed on 15 February 2018).

by the machine.[50] As such, any party wishing to challenge the conclusion of the robot expert could refer the dispute to a duly constituted arbitral tribunal, composed of human arbitrators.

Given the current legal framework, fully robotised arbitration will not become a reality in the near future. However, prospects of automated expert determination are much more likely. They will lead the way to speedy, less-costly and accurate calculations or determinations, to the benefit of parties in various specific sectors.

50 See P. Ortolani,'Self-Enforcing Online Dispute Resolution: Lessons from Bitcoin' (2016) 36 *Oxford Journal of Legal Studies* 595 at 603-04.