Blockchain is seen by many as the most significant technological breakthrough since the advent of the internet. Digital currencies based on blockchain technology have monopolised many of the headlines, notably with the huge price volatility of Bitcoin in recent months. However, blockchain has far wider-reaching potential and new applications are capable of fundamentally disrupting business practices across many sectors.

First published in Inside Arbitration, Issue 5

Indeed, blockchain could have a similarly disruptive and revolutionary effect as did the internet on the way that business is conducted across the globe, having the potential to radically improve efficiency and eliminate centralised trust dependency models.
Some blockchain advocates have suggested that blockchain enables its users to eliminate disputes altogether or, at least, to significantly disrupt conventional methods for dispute resolution. However, this risks overstating what blockchain can achieve in the context of dispute resolution, at least in the short to medium term. This is particularly true of smart contracts and, chiefly, their purported ability to eliminate disputes through wholesale self-enforcement. Blockchain protocols and their smart contract applications need to be developed methodically and in the recognition that this technology will not be a panacea for dispute-free self-enforcement of all contractual obligations.

Craig Tevendale and Charlie Morgan explain blockchain technology in more detail below and consider at a high-level some of its potential applications. They then briefly address the 'real world' limitations of smart contracts. Finally, they consider how partially self-executing agreements can prosper as an effective tool to improve efficiency of contract execution, in a manner compatible with existing methods of dispute resolution.

**WHAT IS BLOCKCHAIN?**

In simple terms, blockchain is a way of recording data. It is a decentralised public ledger of transactions that is maintained by its users, rather than by a trusted third party. Each blockchain 'protocol' operates on cryptographic technology and acts as a dynamic registry for the exchange of digital assets and verification of digital information.

Transactions on the blockchain are divided into encrypted, irreversible and time-stamped 'blocks' which are shared and corroborated by the users of the blockchain (or a selection of such users). Users of the blockchain can see the block (and, in some cases, approve it), but nobody can unilaterally modify any block that has been approved. Each 'block' is then chained to the next block, using cryptographic signatures to ensure validity and prevent tampering.

**SMART CONTRACTS**

Blockchain technology supports applications that go beyond virtual currencies. In short, the blockchain enables complex transactions of digital assets to take place in a decentralised manner. Various blockchain protocols have been developed, and the characteristics of each one impacts upon its ability to support any given cryptographic application. The best known blockchain protocols are perhaps Bitcoin and Ethereum. These platforms are used by others (individuals and businesses) to develop applications customised to their own purposes.

A 'smart contract' is not a contract in the traditional sense. Instead, a smart contract is a software programme built on the blockchain. Smart contracts can be used for allocating digital assets (in their simplest form, digital currencies) between two parties, when specific conditions or requirements established in the programme are met. In short, a smart contract is the translation into software code of an agreement reached between two or more parties.
A smart contract can include the contractual arrangement itself, the preconditions necessary for the parties' respective obligations to take effect and the mechanics for the actual execution of the obligation in question (once those preconditions are met). In a purely digital world, and assuming a perfect one in which software bugs could be eliminated, smart contracts could avoid the need for further input from the parties to the agreement or any trusted third party, such that the contract, or certain parts of it, become self-fulfilling.

SMART LEGAL CONTRACTS AND SMART CLAUSES

Given that a smart contract is not a contract in the traditional sense, this term can cause confusion. Therefore, it is worth coining two additional terms. The first is a 'smart clause', being a traditional legal clause, the content of which is (in addition to forming part of a traditional contract) executed digitally as a smart contract on a blockchain. Similarly, 'smart legal contracts' can be used to refer to a written agreement (entered into in compliance with traditional principles of contract formation), which contains one or more smart clauses. In this sense, a smart legal contract is essentially the incorporation into a traditional legal agreement of smart contract mechanics, which will enable the parties' agreement to evolve over time and, in relation to those clauses for which this is practicable and efficient, to self-enforce on the blockchain.

BLOCKCHAIN AND SMART CONTRACTS WILL NOT ELIMINATE DISPUTES ALTOGETHER

Some technologists have been heard to proclaim that the advent of blockchain and smart contracts will avoid disputes altogether on the basis that the parties' bargain is automatically implemented in a decentralised manner, when the conditions agreed between the parties are fulfilled. However, that view disregards the way in which disputes generally arise.

There is no doubt that blockchain technologies have the ability to change the way in which business is done in the future. For example (and there are far too many such examples to mention), at the end of last year, a consortium including energy supermajors BP and Royal Dutch Shell announced the development of a blockchain-based digital platform for energy commodities trading which is expected to start by end-2018. The Australian Securities Exchange (ASX) was then the first global exchange to announce that it would replace its settlement and clearing system with blockchain technology. The trend continues in 2018, with the French government opening the way for the trading of unlisted securities using blockchain.

However, the performance of actions on the blockchain is limited to the digital world, whilst much of the performance required under commercial contracts takes place in the physical world. As a result, while self-executing smart contracts and blockchain applications have the potential to increase the efficiency of dispute resolution dramatically, disputes will not disappear altogether. On the contrary, the irreversible nature of the blockchain makes it crucial that any self-enforcing aspects of parties' agreement are anchored within a valid legal framework and that the parties identify at the outset the applicable dispute resolution mechanism.
By way of simple example, a smart contract has no means by which to verify whether external data is correct; the programme simply retrieves digital data when the function calls for it, and applies that data to determine the next 'transaction' (or step) in the software's application. If the data received by the smart contract is incorrect, the software may execute in a manner that is contrary to the parties' bargain. Furthermore, 'bugs' are frequently identified in software programmes and coding. For these and many other reasons, disputes will arise in relation to self-executing smart contracts and, when they do, it will be essential for parties to be able to determine their rights and obligations under relevant laws and through an agreed dispute resolution mechanism.

... a smart contract has no means by which to verify whether external data is correct

Smart legal contracts offer a pragmatic solution, therefore, for those parties seeking to reap the benefits of blockchain technology, while retaining robust dispute resolution mechanics anchored in the real world. Smart legal contracts can ensure that parties preserve their ability to resolve both blockchain and real-world disputes in a single chosen dispute resolution forum (or tailored mechanisms for different types of disputes, if the parties so elect). They also ensure that all of the parties' rights and obligations pertaining to a legal relationship (or a particular aspect thereof) can be identified readily in a single document.

NO LEGAL VACUUM: REAL WORLD ISSUES OF GOVERNING LAW AND JURISDICTION

Indeed, if a smart contract is to be legally binding (as well as being immutable following publication to the blockchain as a matter of practice), it needs to be subject to the contract law of a given jurisdiction. Further, insofar as it is intended to effect obligations agreed between the parties, those obligations must also be capable of enforcement even if there is a bug in the software programme and the obligation of one party is not automatically performed. As such, the parties must be able to determine which decision-maker has jurisdiction to hear and decide upon any dispute.

Therefore, if parties do not anchor their smart contracts into a smart legal contract (or otherwise enter into a standalone legal agreement which governs disputes arising from the smart contract) and agree the applicable law and decision-maker expressly between them, the decentralised nature of the blockchain (with its users and servers located in many different jurisdictions across the globe) will cause very complex conflict of laws questions regarding the applicable laws and the courts that have jurisdiction to determine 'blockchain disputes'. The ability of its users to operate on some blockchain protocols through pseudonyms, with near-anonymity, represents another obstacle to the resolution of such disputes through arbitration (eg by consent of the parties once the dispute has arisen).
In light of this, it would be advisable for each blockchain protocol to specify that disputes arising in relation to transactions published on the blockchain shall, unless otherwise expressly agreed between parties to a contract on the blockchain, be referred to a neutral, binding dispute resolution mechanism. This would not replace the need for smart legal contracts, but might help to provide some form of safety net in the event that parties overestimate the attributes and capabilities of smart contracts. The obvious candidate for resolving such disputes is international arbitration. Arbitration offers parties the ability to select individuals with the necessary experience to resolve their disputes effectively (whether sector-specific, legal or technology-related). The enforceability of arbitration awards across the globe under the New York Convention is also of considerable benefit in this context (ie where users of the blockchain – and their assets – are spread across the world and may be difficult to trace given the pseudonymity of the blockchain).

Coding programmes are also being developed to allow for arbitration to take place 'on the blockchain', which can be then built into parties' smart contracts. One of these protocols was tested through mock arbitration proceedings last year, as a means of suspending the operation of a smart contract pending resolution of the parties' dispute. Those exciting initiatives are beyond the scope of this article, but we continue to consider their relevance for our clients. However, given the continuing regulatory uncertainties surrounding the use of blockchain and the inescapable risk of software bugs, it remains advisable to incorporate any such dispute resolution mechanism within a smart legal contract. This will enable parties to harness the benefits of blockchain, while mitigating the risks of unforeseen challenges.

CONCLUSION

Cryptographic technologies which support blockchain and its applications such as smart contracts are capable of creating significant efficiencies in many industries around the world, including through the effective implementation of contracts.

For contractual obligations which are based on or are implemented through blockchain technology, we may well see changes in how disputes arise and how they are resolved. For example, the scope of disputes may become narrower, focused on a particular failed step in the blockchain, and disputes may be resolved through virtual platforms. However, these technologies are still untested in mainstream commercial application, and many questions remain about how their use will be regulated. **For now at least, users would be well advised to treat smart contracts as a software translation of standalone 'traditional' contractual obligations, which operate under a given law and which are subject to the jurisdiction of a particular decision-maker who can hear and decide upon any disputes.** Parties who disregard these questions due to the so-called self-executing nature of these digital 'contracts' will increase their legal risk, and likely encounter the very real world problems of increased uncertainty and exacerbated cost in determining how and by whom disputes will be resolved. This in turn could delay the global adoption of blockchain applications more widely.

**Parties should treat blockchain applications as an effective tool for improving efficiency in contractual implantation, while ensuring that the entirety of their agreement is anchored within a valid legal framework governed by robust means of dispute resolution.**
KEY CONTACTS

If you have any questions, or would like to know how this might affect your business, phone, or email these key contacts.

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