

The impact of Blockchain on International Arbitration: Present and Future Uses of this Revolutionary Technology

Luis Miguel Velarde Saffer¹ and Isabela Lacreta^{2 3}

*Change is the law of life. And those who look only to the
past or present are certain to miss the future.*

John F. Kennedy⁴

Introduction

Technology and technological developments are the talk of the day; they are “à la mode”. New technological products are becoming available on a daily basis, transforming the world we live in and the way things are done. Robots, self-driving cars, automated homes, virtual reality, and the fact that almost everything one needs is a click away are just a few examples of how technology is shaping modern life.

Technology is reshaping the way in which things are done in several industries. The financial sector has seen the rapid development of online banking, real time and worldwide wire transfers and the rise of FinTech⁵ that have been disrupting the market as we know it. The healthcare industry has also seen rapid advancements thanks to technology. In addition to a myriad of minimally-invasive treatments and new drugs and vaccines, the development of new

¹ Luis Miguel Velarde Saffer is a senior associate in the International Arbitration Department of Dechert (Paris), LLP. He holds an LL.M. from Harvard Law School, and is a former Professor of Contract Law at the Catholic University of Peru and the University of the Pacific. He is the author of the book “Contracts: Theory and Practice. A Comparative Analysis” (originals in Spanish), and frequently publishes on international arbitration related topics.

² Isabela Lacreta is a visiting attorney in the International Arbitration Department of Dechert (Paris) LLP. She is a PhD candidate at the University of São Paulo.

³ The authors thank Mr Panos Theodoropoulos for his valuable comments to a first draft of this article.

⁴ John F. Kennedy’s speech at the Assembly Hall at the Paulskirche in Frankfurt, 26.06.1963.

⁵ FinTech is the shortened name for Financial Technology and is used to describe new technologies that seek to improve and automate the delivery and use of financial services. See Julia Kagan, Financial Technology – Fintech. Investopedia, 25.06.2019, available at: “<https://www.investopedia.com/terms/f/fintech.asp>”.

technologies such as 5G internet connection brings the promise of further advancements in which surgeries will be performed remotely with the use of robotic arms.⁶

However, the technological impact and advancements in the legal industry have been slower than in other industries. This has been the case for several reasons.

First, lawyers are more attached than other professionals to their traditional way of doing things, and are known for having a specific way of thinking and problem-solving. Lawyers foster and feel comfortable with this, thus preferring not to see this scheme altered. This, added to the fact that lawyers tend to be risk-averse, explains why they may not be as open as others to trying new things (which, by the way, would require further efforts to learn and adjust).

Second, lawyers may fear that they – and their work – could become less essential (and even disposable) if the use of technology continues to expand in the legal industry. For instance, natural language processing tools can be used to scan and identify documents relevant to a given case, legal drafting can be automated (this is already being used, especially in mass litigation) and the analysis of jurisprudence can be done by machines, also programmed to predict outcomes. This fear is, to a certain extent, comparable to the disruption that Uber and Airbnb brought to the public transportation and hospitality industries, which was enthusiastically embraced by customers (who, just like companies, seek to reduce costs).

Third, lawyers are concerned that technology could further expose their practice to tampering and their clients' personal data to privacy violations. As to the former, the increasing risk of hacker attacks or phishing attempts puts sensitive information at risk and can jeopardize legal strategies and business deals.⁷ As to the latter, the breach of technological security protocols could result in the leak of clients' and staff's personal data.⁸ Protection of personal data is of the

⁶ Anthony Cuthbertson, Surgeon Performs World's First Remote Operation Using '5G Surgery' on Animal in China. *The Independent*, 17.01.2019, available at: "<https://www.independent.co.uk/life-style/gadgets-and-tech/news/5g-surgery-china-robotic-operation-a8732861.html>".

⁷ Consider as an example the recent hack to Portugal's largest law firm, PLMJ. Several e-mails and documents concerning a confidential investigation for corruption charges involving the Benfica football club were made public. See *PLMJ Hacked*. *Legal Insider*, May 2019, available at: "<https://www.legaltechnology.com/wp-content/uploads/2019/05/insider323.pdf>".

⁸ John Hyde, Hacked firm says client and staff details spread on Twitter. *The Law Society Gazette*, 29.03.2018, available at: "<https://www.lawgazette.co.uk/practice/hacked-firm-says-client-and-staff-details-spread-on-twitter/5065491.article>".

greatest importance nowadays, as evidenced by the large number of recently enacted regulations such as the new European General Data Protection Regulation (“GDPR”).⁹

Fourth, some argue that lawyers are not business-oriented, in the sense that the legal industry is more focused on the lawyer itself than on the client. A reluctance to embrace the fact that the legal industry consists of much more than lawyers – including paraprofessionals, managers, financiers and technologists, to name a few – together with the profession’s protective regulations are pointed to as another reason why the legal industry has not been as receptive to technological developments as other industries.¹⁰

These and other reasons may explain why technology has taken longer to enter into and disrupt the legal industry. Technology developers appear to have prioritized other industries in light of their higher flexibility and propensity to adapt.

This paper will focus on the use of blockchain, a somewhat recent – and still unknown to many – technology, in the specific field of international arbitration. After explaining what blockchain is (**Section I**) and how it is currently being used inside and outside international arbitration (**Section II**), we will discuss how blockchain can be further developed in international arbitration for the overall benefit of its users (**Section III**).

I. What is blockchain?

Blockchain is the technology of a decentralized database first developed for transactions using the crypto-currency known as Bitcoin.

Towards the end of the first decade of the 2000s, an anonymous person or group of people under the alias of Satoshi Nakamoto publicly opposed and strongly criticized the banking system, which allows banks – *i.e.*, intermediaries to transactions – to use the funds entrusted to them to fund other investments (only requiring them to keep a small fraction of the funds). This criticism

⁹ Regulation (EU) 2016/679 of the European Parliament and of the Council dated 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, available at: “<https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32016R0679>”.

¹⁰ Mark A. Cohen, Legal Innovation is the Rage, but there’s Plenty of Resistance. *Forbes*, 30.08.2018, available at: “<https://www.forbes.com/sites/markcohen1/2018/08/30/legal-innovation-is-the-rage-but-theres-plenty-of-resistance/#6f9eca957cdd>”.

was supported by the 2008 financial crisis, which saw a US\$ 700 billion bank bailout take place in the USA alone as a result of the subprime mortgage crisis.¹¹

In this context, Satoshi Nakamoto decided to create a decentralized peer-to-peer (P2P) system whereby people could transact directly, without going through intermediaries or middle agents. For this purpose, he created a purely digital currency called Bitcoin, which was not dependent on the banking system but would nonetheless allow users to make payments just as with regular currency.

Bitcoin is a crypto-currency, that is, “*an electronic payment system based on cryptographic proof instead of trust, [which allows] any two willing parties to transact directly with each other without the need for a trusted third party.*”¹² When publicizing the creation of Bitcoin, Nakamoto wrote:

*The root problem with conventional currency is all the trust that’s required to make it work. The central bank must be trusted not to debase the currency, but the history of fiat currencies is full of breaches of that trust. Banks must be trusted to hold our money and transfer it electronically, but they lend it out in waves of credit bubbles with barely a fraction in reserve.*¹³

Previous attempts by others to create a crypto-currency had failed because it was too difficult to prevent the double expenditure of the same coin (the digital information of the crypto-currency could be copied so as to allow the use of the same coin in multiple transactions; this does not usually happen with physical currency because they are hard to replicate). To avoid this, Nakamoto created an underlying technology that allowed each transaction using Bitcoin to be safely recorded and validated, thus circumventing the risk of fraud.¹⁴ The underlying technology created by Nakamoto was called the “Nakamoto Blockchain”, the first of many blockchains.

¹¹ Mike Collins, The Big Bank Bailout. Forbes, 14/07/2015, available at: “<https://www.forbes.com/sites/mikecollins/2015/07/14/the-big-bank-bailout/#466fe06f2d83>”. According to some commentators, the total amount of the bailout has already surpassed the US\$ 4.6 trillion.

¹² Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, at p. 1, available at: “<https://bitcoin.org/bitcoin.pdf>”.

¹³ Satoshi Nakamoto, Bitcoin open source implementation of P2P currency. P2P Foundation, 11.02.2009, available at: “<http://p2pfoundation.ning.com/forum/topics/bitcoin-open-source>”.

¹⁴ As each transaction – and the Bitcoins used in them – was recorded, the possibility of double-expenditure of the same Bitcoin became exceedingly difficult (this was the case because, as will be explained later, this

A blockchain is a “collection of data records in the form of blocks which are eventually combined to form a chain of database which henceforth cannot be subjected to any change.”¹⁵ In other words, a blockchain – or chain of blocks – is a registry that functions as a distributed immutable ledger and, just like the traditional manual ledgers, records information (*e.g.*, ownership data, transactions, etc.) over time. However, unlike manual ledgers, a blockchain cannot be tampered with (it is immutable)¹⁶ and is shared and stored in several servers at the same time (it is distributed).

Even though blockchain technology was first developed as the platform underlying cryptocurrency transactions, it has since found application in many different and non-crypto-related fields since it is an independent and self-standing technology.

So how can a transaction be recorded in the blockchain? When a transaction is transmitted to the blockchain, a block is created with all the information that underlies that transaction (*i.e.*, sender, receiver, type of transaction, amount, etc.) and sent to every node¹⁷ in the blockchain. This commences a mining process, which consists of solving a mathematical problem (*i.e.*, a crypto-puzzle) that will allow that specific block to be definitely added to the chain. Miners compete against each other to solve such puzzles. After one of the nodes solves the crypto-puzzle, at least half of the other nodes must validate the puzzle’s solution so that the block can be added to the chain. The nodes get crypto-coins as a reward for the puzzle solving and for validating the puzzle’s solution (*Proof of Work*).

would require an immense amount of computing power). See Jake Frankenfield, Double-Spending. Investopedia, 17.08.2019, available at: “<https://www.investopedia.com/terms/d/doublespending.asp>”.

¹⁵ James Tredwell, Top 10 Blockchain Platforms to watch for in 2018. Thrive Global, 07.10.2018, available at: “<https://thriveglobal.com/stories/top-10-blockchain-platforms-to-watch-for-in-2018/>”.

¹⁶ Since the blocks are recorded in the nodes that form the blockchain – or, at least, in part of them – the data can only be altered if each of the block’s transactions are individually modified in each of the nodes in which the information is stored. To do this, all these blocks would need to be re-mined until all the blocks in the chain reflect the altered data. Considering that the computing power required to achieve this modification is enormous – and probably only theoretical – it is safe to say that blockchains are immutable. Abnishek Signh, What makes a blockchain network immutable? Quora, 02.01.2018, available at: “<https://www.quora.com/What-makes-a-blockchain-network-immutable>”.

¹⁷ Nodes are the devices – *i.e.*, computers, laptops, servers, etc. – on the blockchain. They are connected to each other, store parts or the totality of the blockchain data and broadcast the transaction history to other nodes. Since the blockchain is dependent on the existence and connection of the nodes, it could be said that the nodes are the blockchain. Jimi S., Blockchain: What are nodes and masternodes? Medium, 05.09.2018, available at: “<https://medium.com/coinmonks/blockchain-what-is-a-node-or-masternode-and-what-does-it-do-4d9a4200938f>”.

Mining works just as gold mining does, but instead of expending resources to find gold and add it to circulation, it is Central Processing Unit (“CPU”) time and electricity that is expended. The inventive mechanism of rewarding nodes encourages them to be honest and makes blockchain a highly safe technology.¹⁸ As explained in Nakamoto’s white paper, “[t]he [blockchain] system is secure as long as honest nodes collectively control more CPU power than any cooperating group of attacker nodes. [...] [blockchain] quickly becomes computationally impractical for an attacker to change if honest nodes control a majority of CPU power.”¹⁹

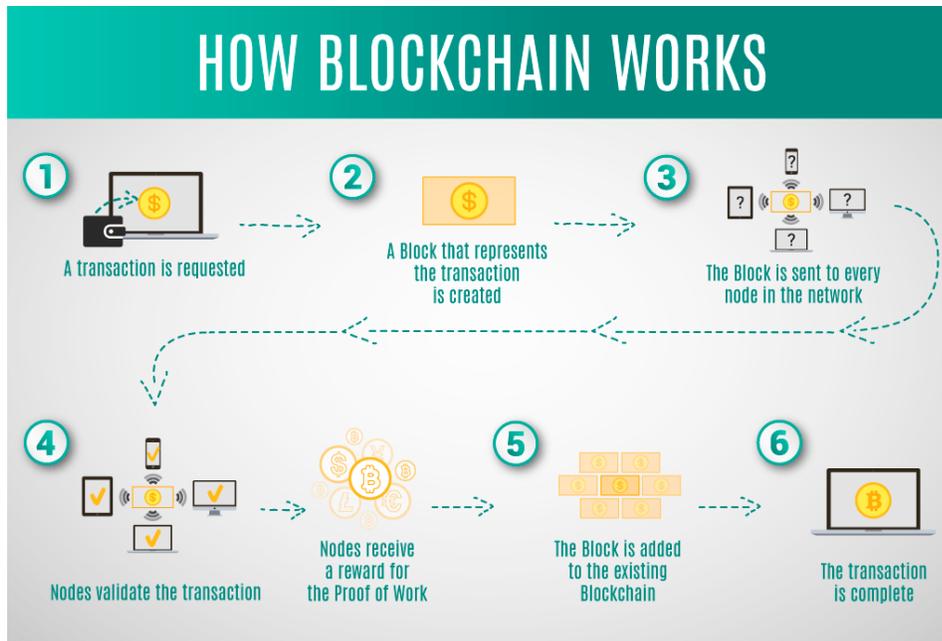
Once a new block is approved, it is recorded in the blockchain’s nodes. Each record on the ledger has a unique key. The records are chained together because the information from the previous records is imputed into the new one and accounted for in the creation of its own unique key. The transactions recorded can be kept confidential or made public, depending on the type of ledger that is chosen.

The graphic below shows the steps that need to be followed to record a transaction in the blockchain.²⁰

¹⁸ Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, at p. 4, available at: “<https://bitcoin.org/bitcoin.pdf>”.

¹⁹ Satoshi Nakamoto, Bitcoin: A Peer-to-Peer Electronic Cash System, at pp. 1, 8, available at: “<https://bitcoin.org/bitcoin.pdf>”.

²⁰ Anastasiia Lastovetska, Blockchain Architecture Basics: Components, Structure, Benefits & Creation. MLSDev, 31.01.2019, available at: “<https://mlsdev.com/blog/156-how-to-build-your-own-blockchain-architecture>”.



Blockchain technology is considered revolutionary “[...] because it addresses th[e] problem of trust. Blockchain allows for a public, secure, authenticated ledger of any digital asset. It decentralizes data from the few to the many, removing the need for an intermediary, like a bank, to maintain the ledger.”²¹ Blockchain holds much promise in fixing problems related to data integrity, supply-chain transparency and to boost overall efficiency throughout every single industry.

The potential uses of the blockchain technology are innumerable. To mention just a few examples:

- Blockchain technology could eliminate the need to keep a manual registry for civil records (e.g., birth, marriage and death certificates), medical history, real estate transactions and accounting data. These documents (and others) would be recorded in the blockchain, thus being immutable and protected against fraud;
- By relying on a blockchain, fashion and pharmaceutical supply chains could make information available to their end consumers on every step that their products have taken to make it to the store shelves. The same could be applied to the mining

²¹ Rachel Keyser, Blockchain: A Primer for Governments. Viewpoint, 06.02.2018, available at: “<https://www.viewpointcloud.com/blog/government-technology/blockchain-governments-primer/>”.

industry, which has rigid governmental controls to prevent, among others, human rights abuses. The use of blockchain technology could enable regulators to better supervise mining activities and end consumers to know the precise origin of the minerals purchased.²² De Beers, a global leader in the diamond market, announced in 2018 that it would build an Ethereum-based blockchain²³ – the first blockchain dedicated to smart contracts – to track the path of each diamond from the mining stage until it reaches the retail store;²⁴

- The use of a blockchain can also reduce the need for external financial audits since the assessment of the existence, accuracy and completeness of financial records would be likely done following an automated process.²⁵ This could greatly benefit the securities market, with the reasons being two-fold: listed companies are required to conduct regular audits and because they could benefit from a more accurate and comprehensive data analysis (in opposition to the sample testing that is currently the standard); and
- One of the most publicized uses of blockchain technology is the possibility to create smart contracts, which are “*self-executing or computer protocol contracts on a blockchain where the terms of an agreement can be expressed in code as a conditional statement or conditional block that will execute if a certain expression evaluates to true (sic).*”²⁶ In a smart contract, the conditions of the contract are transformed into code (using zeros and ones) and the rules are written in simple conditional language such as “*if x, then y*”, which allows for its automatic

²² Dena Givari, Can the Application of Blockchain Technology Broaden the Horizons for Arbitration? Kluwer Arbitration Blog, 08.08.2018, available at: “<http://arbitrationblog.kluwerarbitration.com/2018/08/08/blockchain-mining-disputes-scheduled/>”.

²³ See <https://www.ethereum.org/>.

²⁴ Manoj Sharma, De Beers to launch first diamond blockchain; here’s how it will work. Business Today, 14.09.2018, available at: “<https://www.businesstoday.in/current/corporate/de-beers-blockchain-based-tracr-to-integrate-all-diamond-businesses-on-one-platform/story/280941.html>”.

²⁵ Sandro Psaila, Blockchain: A game changer for audit processes. Deloitte, 22.09.2017, available at: “<https://www2.deloitte.com/mt/en/pages/audit/articles/mt-blockchain-a-game-changer-for-audit.html>”.

²⁶ Audrey Nesbitt, Is the Usefulness of Smart Contracts Being Overstated? Medium, 21.11.2018, available at: “<https://medium.com/datadriveninvestor/is-the-usefulness-of-smart-contracts-being-overstated-f7aab67b340e>”.

enforcement. The codes and rules of the smart contract will be stored, verified and self-executed from the blockchain.

Although the idea of smart contracts was first presented in 1996 by Nick Szabo²⁷, it was only with the creation of the “Nakamoto Blockchain” that the technology needed for the construction of smart contracts was made available. A few examples can illustrate the use of smart contracts as a means to simplify day-to-day life:²⁸

The first example relates to consumer transactions. Several insurance companies (such as AXA’s Fizzy²⁹ and PALnetwork³⁰) have added to their portfolio flight-delay insurance via smart contracts. The smart contract is linked to external global air traffic databases (a.k.a., oracles),³¹ which means that **if** the insured flight is delayed for more than two hours or cancelled, **then** the passenger will receive automatic compensation.³² Once the smart contract verifies that any of the insurance conditions has occurred, compensation is automatically triggered eliminating potential disputes between insurer and customer.

The second example relates to succession.³³ In this scenario, if someone wants to leave a will to oversee his/her inheritance establishing a few conditions to allow for

²⁷ Nick Szabo, Smart Contracts: Building Blocks for Digital Markets. 1996, available at: “http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_2.html”.

²⁸ For other examples, see Smart Contracts Alliance in collaboration with Deloitte (org.), Smart Contracts: 12 Use Cases for Business & beyond. Chamber of Digital Commerce, December 2016, at pp. 15-38, available at: “<http://digitalchamber.org/assets/smart-contracts-12-use-cases-for-business-and-beyond.pdf>”.

²⁹ See <https://fizzy.axa/en-gb/>.

³⁰ See <https://www.pal.network/>.

³¹ “*Blockchains and smart contracts cannot access data from outside of their network. In order to know what to do, a smart contract often needs access to information from the outside world that is relevant to the contractual agreement, in the form of electronic data, also referred to as oracles. These oracles are services that send and verify real world occurrences and submit this information to smart contracts, triggering state changes on the blockchain*”. Shermin Voshmgir, Token Economy: How Blockchains and Smart Contracts Revolutionize the Economy. Taschenbuch, 27.06.2019, at p. 90.

³² Maria Terekhova, AXA turns to smart contracts for flight-delay insurance. Business Insider, 15.09.2017, available at: “<https://www.businessinsider.com/axa-turns-to-smart-contracts-for-flight-delay-insurance-2017-9?r=US&IR=T>”.

³³ Vishnu Chundi, Wills and Testaments on the Blockchain – Blockchain Estate Planning. Medium, 06.05.2018, available at: “https://medium.com/@vishnu_3187/wills-and-testaments-on-the-blockchain-crypto-wills-9d2be9171a7d”.

the transfer of funds in favor of his/her beneficiaries (*e.g.*, that a minimum age is reached), creating the will in the blockchain will enable the automatic verification of the conditions and, when applicable, the automatic release and transfer of the funds. Therefore, **if** the daughter of the testator turns 18 years old, **then** she will receive her part of the inheritance.

As with blockchain in general, smart contracts remove the need for intermediaries. Since smart contracts are self-executed, the work currently performed by escrow agents, brokers and perhaps even lawyers, depending on the complexity of the matter, could no longer be necessary.

II. How blockchain technology is currently being used inside and outside international arbitration

The use of technology in international arbitration is still shy. Beyond e-mail, research tools (such as Kluwer Arbitration and Investor State Law-Guide), data storage and sharing platforms (such as Box, Citrix and LegalWorks), exhibit management (ExhibitManager) and e-discovery programs (such as Relativity, Logikcull and Everlaw), the use of technology in international arbitration is limited and most of the existing softwares are not very user friendly.

That said, the use of blockchain technology both inside and outside international arbitration is rapidly increasing.

Inside international arbitration, in recent years we have witnessed the creation and development of online dispute resolution platforms that rely on blockchain technology to increase efficiency and reach a broader number of disputes. To name a few examples:

- **Kleros** is an Ethereum-based startup³⁴ hosted by the Thomson Reuters incubator “*that uses game theoretical incentives for anonymous jurors to adjudicate claims in a fast and transparent way.*”³⁵ Kleros – from the Greek, “*chance*” – provides a

³⁴ See <https://kleros.io/>.

³⁵ Federico Ast and Clément Lesaege, Kleros, a Protocol for a Decentralized Justice System. Medium, 11.09.2017, available at: “<https://medium.com/kleros/kleros-a-decentralized-justice-protocol-for-the-internet-38d596a6300d>”.

platform to resolve small internet-related disputes that arise from smart contracts and which, otherwise, would not get solved because of the small amounts in dispute (e.g., a smart contract whereby party A retains party B to build an internet site for a modest fee).

Kleros is a jury-based platform that, in order to discourage tampering and bias in the decision-making process, rewards a juror only if he/she voted with the majority. To do so, Kleros uses game theory concepts, such as the Schelling point.³⁶ The decisions rendered by these jurors may be appealed. There has been some debate as to whether Kleros can be properly characterized and recognized as a form of arbitration.³⁷

- **CodeLegit** is also an Ethereum-based platform that presents itself as a liaison between blockchain programmers and contractors by providing “legal-by-design” smart contracts, *i.e.*, smart contracts that are compliant with the applicable law. CodeLegit also provides online arbitration services under the blockchain Arbitration Rules, which are based on the UNCITRAL Arbitration Rules and provide “*the parties [with] the chance to solve the problem without leaving the digital world and without filing lawsuits at an analog, ordinary court.*”³⁸ Contrary to Kleros, CodeLegit allows the parties to appoint arbitrators and, if an agreement is not reached, acts as an appointing authority.³⁹

³⁶ According to the Schelling point theory, players (and, in this case, jurors) tend to select a focal point because it fulfills its “*expectation of what the other expects him to expect to be expected to do*”. There is a tendency to choose that specific point simply by believing others will as well. Thomas C Schelling, *The strategy of conflict* (1st ed., Harvard University Press 1960), at p. 57.

³⁷ Kleros has publicly argued that it does qualify as a form of arbitration and complies with all applicable regulations. See Dmitry Narozhny, *Is Kleros Legally Valid as Arbitration? The Blockchain Dispute Resolution Layer*, 12.06.2019, available at: “<https://blog.kleros.io/is-kleros-legally-valid-as-arbitration/>”.

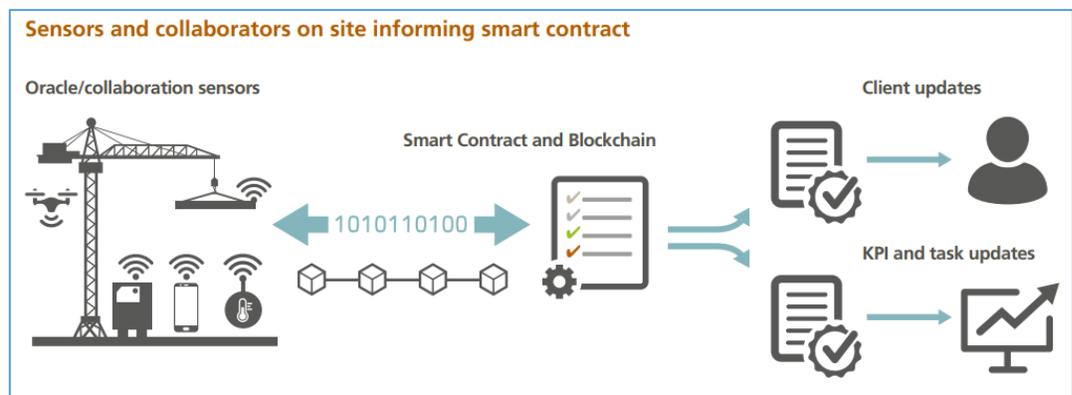
³⁸ See Markus, *Arbitration Library in Smart Contracts is a Must-Have. CodeLegit*, 02.06.2017, available at: “<http://codelegit.com/2017/06/02/arbitration-library-in-smart-contracts-is-a-must-have/>”.

³⁹ A detailed description of the arbitration proceeding is provided in CodeLegit’s White Paper on Blockchain Arbitration, available at “https://docs.google.com/document/d/1v_AdWbMuc2Ei70ghITC1mYX4_5VQsF_28O4PsLckNM4/edit#heading=h.m036npeinawi”.

The examples above demonstrate how blockchain technology is currently being used to date in international arbitration. As discussed in section III below, this technology can be further developed in international arbitration.

Blockchain technology is also being used **outside international arbitration**, as illustrated by the following examples:

- For instance, the **construction industry** utilizes BIM (Building Information Modeling), a type of digital modeling program which, combined with blockchain technology, enhances efficiency, produces cost savings and other improvements in productivity through all phases of civil construction projects. Feeding from several oracles, the combination of BIM and blockchain technology can serve as a single source of truth for data. This dual technology takes construction projects from start to finish by automatically taking into account the project owner's requirements, the site characteristics and applicable legal framework. It also oversees the project's performance to ensure that timeframes and objectives are being met.⁴⁰ The interconnection from site to project owner, passing through the supply chain and subcontractors, can enhance accountability and transparency in the construction industry.⁴¹



⁴⁰ Don Tapscott and Ricardo Viana Vargas, How Blockchain will Change Construction. Harvard Business Review, 26.07.2019, available at: "<https://hbr.org/2019/07/how-blockchain-will-change-construction?ab=hero-subleft-2>".

⁴¹ Balint Penzes, Blockchain Technology in the Construction Industry: Digital Transformation for High Productivity. Institution of Civil Engineers (ICE), December 2018, at p. 16, available at: "<https://www.ice.org.uk/ICEDevelopmentWebPortal/media/Documents/News/Blog/Blockchain-technology-in-Construction-2018-12-17.pdf>".

- In the **music industry**, already-existing services are benefiting from the advantages of blockchain technology. For instance, Ujo music is a music streaming and download platform similar to Spotify but with the important difference that, by being built on a blockchain, allows (i) fans to directly purchase music from their preferred artists, and (ii) royalties to be directly allocated to those involved in the production of the record (*i.e.*, producers, musicians, composers, etc.). Streaming of tracks is free of charge but fans can purchase albums in Dai, a decentralized stablecoin⁴² (and by credit card or Paypal in the future), and the amount generated is transferred directly to the beneficiaries;
- In the **social media industry**, blockchain technology is also being used as an alternative to already existing products. Steemit is a social media platform similar to Facebook but built on a blockchain (the Steem blockchain) that uses the Steem cryptocurrency to reward users for the content they generate. Users vote on posts and comments, and the content that has received the most votes gets rewarded so as to incentivize content creation and curation.⁴³

Steemit’s whitepaper was one of the first public statements criticizing the Silicon Valley’s rationality, which, Steemit argued, is to have users do the work for free by interacting and generating content that interests advertisers, getting nothing in exchange but filling the pockets of the social media’s owner (such as Facebook’s Mark Zuckerberg).⁴⁴

The use of blockchain technology is rapidly spreading. Countries such as Malta, Estonia, Switzerland, the United Arab Emirates and Singapore are already extensively using this technology, without great restrictions.⁴⁵ Malta is known as the “Blockchain Island”. It enacted a

⁴² Stablecoins are cryptocurrencies that attempt to offer price stability and/or that are backed by reserve assets. Adam Hayes, Stablecoin. Investopedia, 09.08.2019, available at: “<https://www.investopedia.com/terms/s/stablecoin.asp>”.

⁴³ Andrew McMillen, The Social Network Doling Out Millions in Ephemeral Money. Wired, 04.10.2017, available at “<https://www.wired.com/story/the-social-network-doling-out-millions-in-ephemeral-money/>”.

⁴⁴ See Steem: an icentivized, blochchain-based, public content platform, August 2017, at p. 5, available at “<https://steem.com/SteemWhitePaper.pdf>”.

⁴⁵ Blockstuffs, Top 10 countries to adopt blockchain technology. Blockstuffs, 28.03.2019, available at: “<https://www.blockstuffs.com/blog/countries-adopting-blockchain>”.

regulatory framework for the use of blockchain technology on 4 July 2018,⁴⁶ established a decentralized bank and stock exchange to give blockchain and cryptocurrency firms easier access to bank accounts,⁴⁷ and recently announced that all rental contracts would be registered in blockchain.⁴⁸ Estonia, in turn, was the first country to use a blockchain-based e-voting service.⁴⁹

III. How can we expect blockchain technology to be used in international arbitration in the years to come?

Blockchain technology will transform the world as we know it. As good as it can sound, however, the fact remains that, as it happened with the Internet in the 90s, blockchain technology is neither well-known nor user friendly yet. As blockchain technology becomes better understood and new usages come to light, recourse to this technology will spread.

This section describes the uses that we believe blockchain technology might have in international arbitration in the future. These potential uses assume a worldwide use of this technology, the existence of a global blockchain-based database with relevant information related to arbitration, and the cooperation of arbitral institutions and arbitration practitioners to keep this database updated. These usages are presented below, divided by stages: the drafting of the arbitration agreement (**Section 3.1**), the constitution of the arbitral tribunal (**Section 3.2**), the arbitration proceeding (**Section 3.3**), and the post-award stage (**Section 3.4**).

3.1 The drafting of the arbitration agreement

⁴⁶ Rachel Wolfson, *Maltese Parliament Passes Laws that set Regulatory Framework for Blockchain, Cryptocurrency and DLT*. Forbes, 05.07.2018, available at: <https://www.forbes.com/sites/rachelwolfson/2018/07/05/maltese-parliament-passes-laws-that-set-regulatory-framework-for-blockchain-cryptocurrency-and-dlt/#65594b7649ed>.

⁴⁷ Rasmus Pihl, *“World’s First Decentralized Bank” to Launch in Malta, Backed by Binance*. Toshi Times, August 2018, available at: <https://toshitimes.com/worlds-first-decentralized-bank-to-launch-in-malta-backed-by-binance/>.

⁴⁸ Daniel Kuhn, *Malta to Register all Rent Contracts on Blockchain*. Coindesk, 24.06.2019, available at: <https://www.coindesk.com/malta-to-register-all-rent-contracts-on-blockchain>.

⁴⁹ Kalev Aasmae, *Online voting: Now Estonia teaches the world a lesson in electronic elections*. ZDnet, 08.03.2019, available at: <https://www.zdnet.com/article/online-voting-now-estonia-teaches-the-world-a-lesson-in-electronic-elections/>.

A well drafted arbitration agreement can avoid the headache of debating about its validity and binding nature once a dispute has arisen, either during the arbitration or during annulment/enforcement proceedings. However, the reality is that, in many cases, this essential clause is neglected until the last minute, to the point of being called the “midnight clause”.

A blockchain-based platform that has been inputted with all of the relevant legal data can be programmed to assess and suggest – depending on the contract’s characteristics and the will of the parties – the best fitted arbitration agreement, seat and applicable law for the contract at hand.

Consider an agreement whose purpose is the sale of marijuana. Most jurisdictions consider marijuana an illicit drug, thus prohibiting its sale. The blockchain would be able to identify the jurisdictions where the sale of marijuana is not prohibited and, after considering other potentially relevant criteria to the parties, would be able to recommend the law of one of those jurisdictions as the applicable one to the contract at hand (as well as the best seat for a potential arbitration). This will enable the parties to have a valid contract with an arbitration clause fitted for the case.

3.2. The constitution of the arbitral tribunal

The appointment of an arbitrator is a very delicate decision, often times considered the most important decision of the arbitration. This process can be facilitated – and improved – by the use of the blockchain, which, relying on both objective and subjective data, can provide interested parties with the most appropriate candidates for their case.

The objective analysis would be based on the data available on the blockchain, which could include previous nominations, challenges, conflicts, awards rendered, publications, work as counsel, etc. Based on this data, a blockchain platform duly programmed would be able to produce a list of the “best-suited” candidates for each case.

In addition, arbitration users can provide subjective feedback on the quality of the work of those arbitrators that they have seen in action. This feature is being proposed by Arbitrator Intelligence,⁵⁰ not without criticism. Users fear that the subjective feedback may be tainted by the party and/or counsel’s dissatisfaction from having lost a case or by their exaltation from having

⁵⁰ See <https://arbitratorintelligence.com/>.

won it,⁵¹ a risk that could be reduced by inputting into the database only post-award feedback when it is consistent between both sides or, alternatively, by only inputting into the database pre-award feedback. On the necessity to reach consensus on the post-award feedback to be provided, Mauricio Duarte has stated that:

In arbitration, with blockchain technology, parties could agree to voluntarily share their experience with a given arbitrator. This would mean that both parties would have to agree whether to share a positive or negative review on the competency of the arbitrator. If both parties do not agree to submit a review, the losing party does not have the right to unilaterally give a review on the competency of the arbitrator. The software protocol, powered by a system of public-private key encryption and digital signatures, would create a mechanism in which both parties must agree beforehand. By creating this “pre-consensus” mechanism, malicious and dishonest reviews could be avoided. With this system in place, parties to an arbitration would police themselves. That is the essence of a peer-to-peer network.⁵²

The use of a blockchain-powered arbitrator selection tool would make the arbitrator selection process faster and more effective to the parties. It would also (i) make this process more just, as parties and counsel would all have access to the same information, and (ii) reduce the costs of the proceeding, as the number of arbitrator challenges (based on conflicts or failure to make disclosures) and the likelihood of annulment of arbitral awards would arguably be lower.

This same arbitrator selection tool could be used by appointing authorities to choose the most appropriate arbitrator for a particular case. With the relevant information and the consent of the parties, blockchain could potentially be programmed to make these appointments itself.

3.3 Arbitral proceeding stage

The use of blockchain technology can also provide several benefits during the arbitral proceeding.

⁵¹ Philippa Charles, Arbitration Selection – Shining Light on a Dark Art. Conventus Law, 05.10.2018, available at: “<http://www.conventuslaw.com/report/arbitrator-selection-shining-light-on-a-dark-art/>”.

⁵² Mauricio Duarte, Reputation Arbitration: Building a Decentralized Reputation System for Arbitrators? Kluwer Arbitration Blog, 26.07.2018, available at: “<http://arbitrationblog.kluwerarbitration.com/2018/07/26/reputation-arbitration-building-decentralized-reputation-system-arbitrators/>”.

First, the administration of the arbitral proceeding could be fully automated. Once the relevant rules and calendars are inputted into a duly programmed blockchain-based application, the latter can administer the proceeding, ensuring compliance with deadlines, sharing submissions with the parties and the tribunal when they are received, collecting fees and allocating them as relevant, etc.

Second, all of the documents of the case (submissions, evidence, procedural orders, etc.) can be securely and confidentially stored in a private and encrypted cyber secure space in the blockchain.⁵³ The case record would be available for consultation by the parties, the tribunal and other authorized parties anytime. The blockchain could be programmed to accept the uploading of documents only on specific dates so as to ensure compliance with deadlines.

Third, a blockchain platform could be used to reduce the cost of ancillary services such as translation, transcription, interpretation and authentication of documents and evidence.⁵⁴ All those tasks can be made possible by using artificial intelligence and, when performed in the Blockchain, the information is duly preserved and its confidentiality guaranteed. In fact, as artificial intelligence would reduce the number of human service providers, it would also reduce the risk of sensitive information being leaked.

Fourth, the escrow capacities of the blockchain can be used to guarantee payments, eliminating the costs of paying banking fees to have access to an escrow account or other form of traditional banking warranties.

3.4 Post-award stage

Blockchain technology can also be used to improve the effectiveness and reduce the complexity of the post-award stage.

⁵³ Marike R. P. Paulson, The Blockchain ADR: Bringing International Arbitration to the New Age. Kluwer Arbitration Blog, 09.10.2018, available at: "<http://arbitrationblog.kluwerarbitration.com/2018/10/09/blockchain-adr-bringing-international-arbitration-new-age/>".

⁵⁴ Ibrahim Mohamed Nour Shehata, The Marriage of Artificial Intelligence & Blockchain in International Arbitration: A Peak into the Near Future!!! Kluwer Arbitration Blog, 12.11.2018, available at: "<http://arbitrationblog.kluwerarbitration.com/2018/11/12/the-marriage-of-artificial-intelligence-blockchain-in-international-arbitration-a-peak-into-the-near-future/>".

First, a blockchain-based application could be programmed to scrutinize arbitral awards so as to assess their compliance with formal (*e.g.*, language, date, signatures) requirements under the applicable law (*e.g.*, the law of the seat or the law of the jurisdiction where the award will be enforced). The analyses would further the likelihood that awards be recognized and enforced in the relevant foreign jurisdictions.

Second, the existence of the abovementioned scrutiny process could enable the establishment – in foreign jurisdictions – of a simplified process to recognize awards. In other words, a blockchain-based application would perform an initial award assessment and, subsequently, make it available to the relevant foreign jurisdiction for a simplified recognition process.

Third, the use of the blockchain would eliminate the need to produce certified copies of awards, to apostille them and/or to comply with other formalities aimed at ensuring the authenticity of awards as blockchain technology provides such proof in itself.⁵⁵

Fourth, the blockchain platform could be programmed based on the applicable procedural rules and the parties' agreement to redact submissions, procedural orders and awards so as to protect their confidentiality when they are published later. In addition, with the aid of artificial intelligence, relevant statistics and trends could also be produced and published. Their publication would help level the playing field among international arbitration practitioners and, as a result, increase the system's legitimacy. An advantage of applying the confidentiality redactions in the blockchain is that the system itself would have access to the submissions, orders and awards in their entirety, thus being able to take the full documents into consideration when producing relevant statistics and/or screening for the right arbitrator as part of the arbitrator appointment process.

Fifth, the escrow capacities of the blockchain can also be programmed so as to allow the automatic enforcement of the award. For instance, CodeLegit's blockchain allows the arbitrator to amend the parties' smart contract to reflect its decision on the disputed issues. As a result, the smart contract will execute the award automatically, transferring funds from the losing party to the

⁵⁵ Mauricio Duarte, Could Blockchain Help the Recognition of International Arbitration Awards? Kluwer Arbitration Blog, 20.04.2018, available at: "<http://arbitrationblog.kluwerarbitration.com/2018/04/20/blockchain-help-recognition-international-arbitration-awards/>".

winning party based on such amendments, and from that point onwards the smart contract will execute itself based on the amended parameters.⁵⁶

Conclusion

Blockchain technology is truly revolutionary. It has changed, and will continue to change, the *modus operandi* of several industries, and will certainly do the same with the legal industry.

As discussed in this article, blockchain technology offers an array of possible uses that could enhance the effectiveness and reach of international arbitration. Its thoughtful application could result in important time and cost savings (two important criticisms faced by arbitration nowadays), improve the arbitrator selection process and help level the playing field among arbitration practitioners.

We expect to see new products and services created in the years to come for the benefit of international arbitration users. Lawyers will need to adapt if they do not want to be left out of the game.

⁵⁶ See CodeLegit's White Paper on Blockchain Arbitration, available at "https://docs.google.com/document/d/1v_AdWbMuc2Ei70ghITC1mYX4_5VQsF_28O4PsLckNM4/edit#heading=h.m036npeinawi".