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THE ROLE OF INTERNATIONAL ARBITRATION IN RESOLVING CROSS-BORDER SMART CONTRACT DISPUTES: OPPORTUNITIES AND CHALLENGES

Dissertation to obtain a Master's Degree
in Law, in the specialty of Law and Financial
Markets

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Declaration

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Abstract

Smart legal contracts are self-executing and automated contracts that operate on blockchain technology. With the rising usage of smart contracts, disputes that cannot be resolved through traditional means will likely arise. Although they have the potential to revolutionize the way contracts are executed, they also pose unique challenges in terms of dispute resolution. The study will analyze the advantages and disadvantages of resolving smart legal contract disputes through international arbitration, the role of international arbitration institutions in adapting to the use of smart legal contracts, and the potential impact on the development of international arbitration. In addition to exploring international arbitration as a solution for smart legal contract disputes, this research will also examine the potential role of artificial intelligence (AI) in decision-making. The study will analyze the benefits and challenges of using AI in decision-making for smart contract disputes, including the potential impact on the role of arbitrators and the challenges in ensuring the transparency and accountability of AI decision-making processes. The research will also examine the legal and ethical implications of using AI in decision-making, including bias, privacy, and accountability issues.

Os contratos legais inteligentes (*smart legal contracts*) são contratos automatizados que funcionam com recurso à tecnologia *blockchain*. Com a sua crescente utilização, litígios que não podem ser resolvidos através de meios tradicionais tornar-se-ão mais comuns. Embora tenham o potencial de revolucionar a execução contratual, representam também um desafio ímpar em termos de resolução de conflitos. O seguinte estudo irá analisar as vantagens e desvantagens da resolução de litígios de *smart legal contracts* através de arbitragem internacional, o papel das instituições de arbitragem internacional na adaptação à utilização deste tipo de tecnologia e o seu impacto no desenvolvimento da arbitragem internacional. Além de explorar a arbitragem internacional como solução para litígios que envolvam *smart legal contracts*, este estudo examinará também o possível papel da inteligência artificial (AI) na tomada de decisões e gestão do processo arbitral. O estudo analisará os seus benefícios e desafios, assim como o potencial impacto no na escolha e papel dos árbitros e os desafios em assegurar transparência e responsabilização. A investigação também examinará as implicações legais e éticas da utilização de IA na tomada de decisões, incluindo questões de parcialidade, privacidade e responsabilidade.

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Introduction

The widespread adoption of blockchain technology has brought about a new era in commerce, with smart legal contracts significantly facilitating transactions in the digital age. Smart legal contracts are self-executing contracts designed to enforce themselves without intermediaries, thus reducing the cost and increasing the efficiency of transactions.

Although there is extensive literature on the commercial and business impact of blockchain, the effects that it may have on the legal system have not been thoroughly discussed. However, it does not imply that the legal field can sidestep this technology. In fact, there is plenty of evidence to the contrary. For example, the Singapore International Commercial Court ruled on the nature of smart contracts in the landmark case *B2C2 Ltd v Quoine Pte Ltd* [2019] SGHC(I) 03, while other jurisdictions expect a rise in litigation on the matter soon. In the words of Sir Geoffrey Vos, Master of the Rolls and Chair of the UK Jurisdiction Taskforce, "*[t]he one thing I can promise, however, is that there will be litigation about smart contracts when they become ubiquitous in the industries that are served by the Business and Property Courts*".¹

This research aims to examine how international arbitration can be the solution for smart legal contracts disputes, and to analyze its benefits and downsides, ultimately pointing out solutions already in place or suggesting our thoughts on the matter.

First, we will briefly discuss the importance of blockchain technology for the financial markets and debate, describe and classify a smart legal contract. We will point out the legal challenges smart legal contracts present to the Law as a whole and to dispute resolution in particular. Then, we will present our interpretation of a proper arbitration clause for blockchain-related cases.

After that, we will evaluate the current international arbitration legal framework in the topics that will suffer substantial changes regarding smart legal contracts – interim measures, the treatment of digital blockchain evidence and ultimately, the enforcement and recognition of the arbitration awards. For comparison and insights, we will analyse and discuss a blockchain protocol for smart legal contract dispute resolution – Juris Project.

¹ Vos, "Future Proofing", 12.

Lastly, we will look at the future of tech-related alternative dispute resolution, especially the two biggest revolutions: the use of AI in the decision-making process and the creation and use of on-chain arbitration.

We focused our study on smart contracts with legal implications – smart *legal* contracts – on two forms: fully automated and encoded smart legal contracts and traditional contracts with ancillary smart contracts that automate part of the parties’ obligations – known as “split” contracts. We delimited our study to the differences these two scenarios present to the international arbitration procedure in place. We put particular emphasis on the Convention on the Recognition and Enforcement of Foreign Arbitral Awards, also known as the "New York Convention", and the United Nations Commission on International Trade Law Arbitration Rules, also known as the UNCITRAL Arbitration Rules.

1. Introduction to Smart Contracts

1.1 Blockchain and Smart Contracts

Blockchain and smart contracts are part of a new technology with unquestionable potential for the future of e-commerce. For a decade, smart contracts have been receiving much attention within both IT and Legal sectors, with the high expectation that they could become a way to solve a lot of the existing technological and legal problems.

In order to understand smart contracts, we will comprehensively analyse blockchain technology and the changes it can bring to our day-to-day lives.²

Before crypto assets, the focus was always to harmonise the conflict between the individual, the State, and the market;³ the trading of financial assets and the governing procedures will change considerably, and these changes will have clear consequences in regulation, private Law, and market practice.⁴ Furthermore, the gradual adoption of blockchain technology on a broader scale, often with no involvement of intermediaries, the presence of Law is necessary to develop smart contract applications properly.

Blockchain is a distributed ledger technology ("DLT") that allows the storage and transfer of tangible assets – such as real estate property – and intangible assets – such as a voting system or genomic data – across multiple data stores (also known as *ledgers*). To create a database using blockchain technology all data is encrypted, and specific mathematical algorithms generate and verify the data structure. Each transaction is inserted automatically into an information block. Every time the number of transactions goes up, the blockchain also grows. Each block has a *hash* – a digital fingerprint of the total amount of transactions the block stores and the *last block's hash*, which keeps the information stored in these blocks from being altered and any other block from being inserted between the two blocks. With the system, each block secures better verification of the information stored in the previous block of the chain.⁵ This structure is a "transaction blocks" chain, which functions as a distributed ledger. Ultimately, we will have a chain of encrypted data blocks – hence "blockchain".

² Faúndez, *Smart Contracts*, 22-26.

³ Wright and De Filippi, "*Lex Cryptographia*", 4.

⁴ Peach, "Governance" 6-7.

⁵ Faúndez, *Smart Contracts*, 35-36.

With blockchain, the control over the ledger does not depend on any central authority. Instead, exists, at any point in time, one updated version of the ledger and each one of the participants in the chain has a full copy of that ledger. This differs from other technological forms of data storage, such as cloud computing or data replication, that use existing shared ledgers.⁶

For this reason, blockchain technology promises to be a technology that will transform the business world and possibly every aspect of record-keeping or exchange that we currently have.

The distributed ledger concept is a characteristic associated with blockchain technology that can bring significant changes – especially related to smart contracts.

DL systems can be permissioned or permissionless. In permissioned DLs, any node can propose an addition of a transaction replicated to other nodes, potentially even without any consensus mechanism⁷. In the case of a permissioned DL, the administrator is responsible for ensuring that the DL participants are reliable.⁸ In other words, this could mean a shift from a multitude of records relating to the same asset and maintained for different purposes to a single distributed record – significantly reducing the number of additional records.

Blockchain technology guarantees transparency and protection without relying on trust through cryptographic algorithms, consensus mechanisms and peer-to-peer networks.

Cryptographic algorithms represent the core of distributed ledger technology. A cryptographic hash function is applied to the original message whenever a new data entry occurs. Each one of the network participants has a private key that is used for digital signature and a public key that all the network participants know.⁹ That key is then used to (1) validate the sender's identity and (2) identify the recipient of the digital message.¹⁰

⁶ Natarajan, Krause and Gradstein, “DLT and Blockchain”, 17.

⁷ A consensus mechanism is a fault-tolerant mechanism used in a blockchain to reach an agreement on a single state of the network among distributed nodes. These are protocols that make sure all nodes are synchronised with each other and agree on transactions, which are legitimate and are added to the blockchain. For more thorough information: [What Are Consensus Mechanisms in Blockchain and Cryptocurrency?](https://www.investopedia.com/what-are-consensus-mechanisms-in-blockchain-and-cryptocurrency/) ([investopedia.com](https://www.investopedia.com/))

⁸ Natarajan, Krause and Gradstein, “DLT and Blockchain”, 23.

⁹ Securitisation with two keys is also known as asymmetric encryption.

¹⁰ Natarajan, Krause, Gradstein, “DLT and Blockchain”, 21.

The consensus mechanism within the network is achieved through different voting mechanisms. Decentralised consensus uses Proof-of-work¹¹ (PoW) and proof-of-stake¹² (PoS). The most common way of reaching consensus is PoW, which depends on the amount of processing power donated to the network.¹³ In PoS, the creator of the next block is chosen based on his/her holdings of the native cryptocurrencies (i.e., the stake).¹⁴

The consensus mechanism is also essential to handle conflicts between multiple simultaneous competing entries - for example, different nodes propose different transactions on the same asset.¹⁵ Blockchains seek to solve this: the problem of establishing consensus without the need for a centralised repository of information.¹⁶ This technology incentivises reliable and accurate record-keeping competitively while reducing manipulation and tampering.¹⁷

Replacing trust in intermediaries for fail-proof, automated acquisition processes and immutable records is one of the main reasons this technology causes such an impact. The whole digital or financial economy rests on trust: trust that the bank transferred the money, the email was sent and delivered, and the trust that a social media post was only shared with friends. All these situations have something in common: they all have a centralised third party on which we rely, but the third party can be hacked, manipulated, or compromised.¹⁸ Additional mechanisms are needed to guarantee that the updates of records kept by nodes reflect accurate information since practically any node could propose updates to the other nodes, including fraudulent ones.¹⁹

¹¹ Proof of work (PoW) is a form of cryptographic verification in which the party who wants to take part in the blockchain (the prover) proves that a certain amount of a specific computational effort has been expended to others (the verifiers). Verifiers can subsequently confirm this expenditure with minimal effort on their part. For more thorough information: [What Is Proof of Work \(PoW\) in Blockchain? \(investopedia.com\)](https://investopedia.com/what-is-proof-of-work-pow-in-blockchain/)

¹² Proof-of-stake demands that validators stack capital in the form of ETH into a smart contract on Ethereum, which then acts as collateral. If the validator behaves dishonestly or lazily, the link can be destroyed. The validator is then responsible for checking that new blocks propagated over the network are valid and occasionally creating and propagating new blocks themselves. For more thorough information: <https://ethereum.org/en/developers/docs/consensus-mechanisms/pos/>

¹³ Wright and De Filippi, “*Lex Cryptographia*”, 7.

¹⁴ Cong and He, “Blockchain Disruption”, 1761–1762.

¹⁵ Natarajan, Krause and Gradstein, “DLT and Blockchain”, 18.

¹⁶ Yermack, “Corporate Governance”, 27.

¹⁷ Cong and He, “Blockchain Disruption”, 7-8.

¹⁸ Natarajan, Krause and Gradstein, “DLT and Blockchain”, 21.

¹⁹ Peach, “Governance”, 10.

Finally, blockchain technology uses peer-to-peer networks. In these types of systems, is no centre of control commanding the devices' interactions with each other. Instead, all the nodes generally have the same power and can use and perform the same tasks. Meaning they can act as buyers and sellers.²⁰ This way, the involved financial institutions and infrastructures can provide their products and services based on the same information.

Consequently, this can translate into lower costs, better scalability, reliability, and faster market time. At the same time, it would be easier to deliver mandatory reports to the competent supervisor, as the relevant data could be made available by giving the supervisor access to the blockchain record.²¹ There are other verification systems, but none provide the reliability, security, or cost-effective outcomes blockchains do.²²

Because decentralised ledgers ensure the hardware to record and verify information flows between nodes in a computer network,²³ it also ensures that the smart contract code and the smart legal contract operate independently and free from the problems of self-help. In addition, it can enforce an *ex ante* bargain through the smart contract and allow neutral, third-party enforcement decentralised ledger).²⁴ Smart contracts are not *that* smart. However, they still provide a certain degree of predictability, making them appealing legally.²⁵

Smart contracts are an account built on a blockchain infrastructure such as Ethereum, made by compiling code and data that resides at a specific address on a blockchain. User accounts can then interact with a smart contract by submitting transactions that execute a function defined on the smart contract.

Within a blockchain view, smart contract program logic sits within the "block", especially considering Ethereum, the only blockchain built with a Turing complete²⁶ programming language. It is specially designed to create smart contracts and guarantee effective

²⁰ 101 Blockchains website, "Understanding peer-to-peer network".

²¹ Peach, "Governance", 10.

²² José María Anguiano, "'Smart Contracts'"

²³ Allen and Hunn, "Wrapped and Stacked", 31-32.

²⁴ Raskin, "Legality", 317.

²⁵ Anguiano, "Smart Contracts"

²⁶ In computability theory, a system of data-manipulation rules such as a programming language is said to be Turing-complete (or computationally universal) if it can recognize or decide other data-manipulation rule sets. This means a programming language can express, interpret, and execute any task performed by the computer. Turing completeness is used to express the power of such a data-manipulation rule set.

performance.²⁷ Smart contracts can define rules, like a regular contract, and automatically enforce them via the code.²⁸ The execution of smart contracts is, in practice, unstoppable: in the absence of built-in circuit breakers, the performance and enforcement of contractual duties are erased from all human discretion.²⁹

This application can be particularly useful for interacting with assets such as digital tokens that form immaterial objects. The users recur to smart contracts more often when the subject matter of the contract is an intangible object which can be manipulated directly by the smart contract algorithm. They could regulate access to physical assets (for example, using remotely controlled solenoid locks or ignition switches).

For this reason, financial institutions and banks no longer see blockchain technology as a threat to their traditional business model but as an opportunity to innovate. However, it is essential to remember that many conventional securities are immaterial objects too, consisting of a digital computer entry kept by some financial intermediary.³⁰

The technology has been extended further to take in 'real' things: it may soon be used for a wide range of financial assets, including those assets that, unlike virtual currencies, represent a claim against another party. So, for example, technology could be used to make all kinds of payments, and central banks could issue fiat money in this way. Also, blockchain networks could conclude, administer, and settle derivative contracts.³¹

In addition, the non-financial application opportunities are also vast. Possible blockchain applications allow for developing social networks, games, storage platforms or voting systems. The information stored in the blockchain can take any form, from an agreement between parties to how much electricity a lightbulb uses.³² From setting proof of existence of legal documents to royalty payments in the music industry, storing the digital asset's fingerprint instead of holding the digital asset itself makes it possible to achieve anonymity and privacy.³³ Indeed, even "real" property appears in the eyes of the legal system as land registry entries which exist in an informational domain (i.e., the servers of a land registry),

²⁷ Faúndez, *Smart Contracts*, 41.

²⁸ Ethereum website, "Introduction to smart contracts"

²⁹ Peach, "Governance", 6-7.

³⁰ Allen and Hunn, "Wrapped and Stacked", 31-32.

³¹ Peach, "Governance", 3-4.

³² Lisk Academy website, "What is blockchain?".

³³ Crosby, Pattanayak, Verma and Kalyanaraman, "Beyond Bitcoin", 8.

which also lend themselves to the application of blockchain data structures and smart contracts. These characteristics make a large part of our financial economy *prima facie* open for applying smart contracts technology.³⁴

1.2 What are Smart Contracts?

Besides the ledger, the smart contract code and the smart legal contract are the core of smart contracts.³⁵

The smart contract code concerns the coding that wraps the smart contract. This code can be a smart contract and not necessarily have legal consequences if, for instance, the code automates business processes without recourse to the courts of Law to resolve disputes.³⁶

What makes a smart contract legally relevant and, therefore, a smart legal contract (SLC) is still up for debate. First, it contains the legal terms of the agreement in a machine-readable syntax, i.e., its formal logic of operators and conditionals.³⁷ In other words, it portrays and translates natural human language with legal contractual meaning into computer code. Second, the encoded agreement prescribes and triggers the consequences that may surface from compliance or non-compliance with the contractual requirements.³⁸ Although the different legal systems tend to assess an automatically executed contract by the moment of its performance, it is probably more accurate to conclude that the main consequence of the conclusion of a smart contract is not that it gives rise to obligations but rather the self-limitation of certain rights using technical means.³⁹

That said, digital smart contract code and its legal ramifications combine the written contract, the digital instrument that performs these tasks and the frontend with which the parties interact.⁴⁰ This way, the problem of performing contracts is solved by eliminating the human

³⁴ Allen and Hunn, “Wrapped and Stacked”, 31-32.

³⁵ Some other authors prefer not to distinguish between smart contract code and smart legal contract, in a perspective of enforcement instead of parts of the technology. They use the concept of “contractware”. For this perspective: Max Raskin, “The Law and Legality of Smart Contracts” *Georgetown Law Technology Review* no. 305 (2017), 307-308.

³⁶ Madir, “Legal Frameworks?”, 2.

³⁷ Allen and Hunn, “Wrapped and Stacked”, 29-30.

³⁸ Anguiano, “Smart Contracts”

³⁹ Rodríguez, “Ley Aplicable”, 445. This approach to contract law was first developed by Savelyev, “Contract law 2.0: ‘Smart’ contracts as the beginning of the end of classic contract law,” *Information & Communications Technology Law*, 2017, vol. 26, no. 2, 130.

⁴⁰ Allen and Hunn, “Wrapped and Stacked”, 33-34.

element *ex post*. If nothing stops the machine from working, then, by definition, it will ensure performance.

The language in which we make agreements cannot influence those agreements themselves, but smart contracts have the potential to influence contract law profoundly.⁴¹ However, some authors reject that these code sequences can be considered contracts in a traditional sense since they fulfil previously agreed promises, not only listing them down.⁴²

There is not yet a widely accepted legal definition.⁴³ A smart contract (SC) is not a written contract on paper of the traditional kind, nor is it simply an online contract.⁴⁴ Even though a software cannot, just by itself, be considered a contract, the first developers of this idea used this term to refer to any code sequence that could execute the intent of one or both parties of a contract.⁴⁵

These programs can be highly autonomous and reach quite complex levels of decision-making, from simple "if x, then y" coding to a trusted, immutable, and tamper-resistant organisation where all members are held to the rules via the code. Such organisations can even be automated, creating decentralised autonomous organisations (DAOs),⁴⁶ which, once in place, function without human intervention.⁴⁷ Ultimately, we could design typified forms of contract for different solutions.

However, when it comes to using the word "contract", we need to consider that this piece of technology will only be a contract in a legal sense if the requirements for such classification are met and valid, independently of the degree of complexity of the programming language.⁴⁸ They might have legal importance – they should be considered contracts if "they are agent-generated mechanisms to shift rights and obligations".⁴⁹

⁴¹ Allen and Hunn, "Wrapped and Stacked", 29-30.

⁴² Anguiano, "Smart Contracts"

⁴³ The term "smart contract" was first used by Nick Szabo in the 90s to address the creation and digital development of the concept of a vending machine that automatically executes the sale and delivery of goods. In 2015, this idea was applied in blockchain technology with the creation of Ethereum.

⁴⁴ Unsworth, "Smart Contract This!", 20.

⁴⁵ Faúndez, *Smart Contracts*, 55.

⁴⁶ There are ongoing debates in different jurisdictions whether decentralised autonomous organisations (DAOs) should have a legal form, legal personality, legal capacity and ultimately, a special legal regime. For more details: <https://ethereum.org/pt/dao/>

⁴⁷ The EU Blockchain Observatory and Forum, "Legal and Regulatory Framework", 22-23.

⁴⁸ Faúndez, *Smart Contracts*, 51-52.

⁴⁹ Werbach and Cornell, "*ex machina*", 126.

Traditional contracts often contain operational issues – misspells, clashing terms, human employees acting irrationally, and so on. What if there is an anomaly and the code does not do what it is suppose to do? This risk in programming already exists in the use of any computer program.⁵⁰ Thus, it should not be surprising that a 2016 study of Ethereum smart contracts revealed at least 100 errors per 1,000 lines of code. Are the programmers who wrote the incorrect code going to be the ones liable for the smart contract not performing as originally intended? A more subtle form of the liability question concerns the situation in which the code has a vulnerability. An attacker exploits that vulnerability so that the smart contract performs differently than intended, yet precisely how it was programmed.⁵¹

This technology is still evolving, but despite its exciting applications, we must consider that smart contracts also have limitations. Smart contracts alone cannot get information about "real-world" events by design – they cannot send HTTP requests. Another limitation of smart contracts is the maximum contract size: smart contracts can be a maximum of 24KB. There are ways to get around this using oracles. Relying on external information could jeopardise consensus, vital for security and decentralisation.⁵²

Lastly, the fundamentally different notion of enforcement that could be the sole reason why parties would want to use a SLC could also be why others would refuse to use it. "Tamper-proof" technology is typically described as unstoppable distributed networks of computers that, in a technological sense, cannot fail regardless of malicious acts, power cuts, network disruption, natural catastrophes, or any other conceivable event.⁵³ So a software agent, once started, cannot be stopped. For truly "unstoppable" software agents, code must be defined to take the appropriate action in response to various dynamic states that might occur, such as another party defaulting on a required payment. In a genuinely unstoppable "tamper-proof" system version, all such possibilities must be anticipated and appropriate actions determined.⁵⁴

⁵⁰ Madir, "Legal Frameworks?", 13.

⁵¹ Zaslowky, "Smart Contracts Disputes"

⁵² Wackerow, "Introduction"

⁵³ Some innovative methods of enforcement may also be imagined. For example, there is currently debate and experimentation on enforcing the actions of smart contract code at a network level without the need for dispute resolution. We address this phenomenon in chapter 4.

⁵⁴ Clack, Bakshi and Braine, "Smart Contract Templates", 3-5.

Although some groups are actively pursuing tamper-proof smart contract codes, we still think smart legal contracts that are enforceable by traditional legal methods can and should still be pursued and developed for several reasons.

There is a long-standing precedent of using the term 'contract' in economics and political philosophy when referring to agreements that are not necessarily legally binding. For instance, 'contract' can mean something very different to a computer scientist. The developer may not be concerned with whether an agreement can be enforced in court but instead see the opportunity to specify and execute an agreed set of promises in code.⁵⁵

Quite literally, smart contracts do not involve promises and obligations - it instead sets in place a set of consequences that the parties cannot subsequently prevent. Nevertheless, even though they might not constitute promises *per se*, smart contracts are still voluntary mechanisms that claim to alter the rights and duties of the parties. Nevertheless, we believe that smart contracts are, at the conceptual level, still contracts.⁵⁶

It is possible, though, that we end up concluding that legal recognition is irrelevant or necessary in some instances of blockchain applications. But perhaps more realistically, we might conclude that some decentralised and autonomous capabilities of blockchains exclude an *a priori* requirement for legal recognition.⁵⁷

There are two dimensions to a smart contract: the human dimension of entering into and enforcing agreements, and a mechanical and autonomous dimension, derived from technological development.⁵⁸ Smart contracts cannot express the subtle richness of contracts written in natural language. The most beneficial solution is combining the two contract elements into split contracts.⁵⁹ A split contract, or "hybrid", is a legal contract with ancillary smart legal contracts that partially automate the parties' obligations and indirectly ensure and supervise such actions' performance.

⁵⁵ Rius, "Taxonomy", 110.

⁵⁶ Werbach and Cornell, "*ex machina*" 128-129.

⁵⁷ Herian, "Legal Recognition", 9-10.

⁵⁸ Werbach and Cornell, "*ex machina*", 152.

⁵⁹ Miller and Stiegler, "The Digital Path".

1.2.1: Classifications and Taxonomies

From a European continental law perspective, creating regulation is essential to remove legal impediments and prevent legal voids. How smart contracts are defined affects how the Law approaches the phenomenon – too strict a definition will leave some smart contracts applications out of the scope of the Law, unregulated and with less to no protection for the consumer/weakest party. On the other hand, the too-open definition will restrict its usage and possibly force operators to search for different solutions, ultimately undermining technological development.

It could also mean the definition could include smart contracts which are not legally relevant and leave unsupervised the ones that are. Different ways of defining contracts, in terms of legal enforceability, the intent of the parties, or an exchange of promises, complicates the analysis of whether smart contracts are contracts at all.⁶⁰

Nonetheless, the definition we think summarises the term the best is "an automatable and enforceable agreement. Automatable by computer, although some parts may require human input and control. Enforceable either by legal enforcement of rights and obligations or via tamper-proof execution of computer code."⁶¹

We think smart contracts are more the phenomenon where a taxonomy approach works the best. A taxonomical classification sets minimum requirements for applying a regulation/case and provides a classification scheme. The "definition in one sentence" approach is precarious: the definition cannot be too strict nor too vague. Also, since this technology is related to a field that grows at an accelerated speed, a definition used in EU regulation today might be outdated three years from now. Moreover, especially in the EU context, where legislation is translated into 24 official languages, keeping the depth and amplitude of a definition will be a constant source of conflict.

The applications and outcomes of a smart contract are what matters the most and what it *is*. Focusing too much on how smart contracts are built now will keep other technologies with similar outcomes out of our scope in the long run.

⁶⁰ Werbach and Cornell, "*ex machina*", 126.

⁶¹ Clack, Bakshi and Braine, "Smart Contract Templates", 2.

Instead of walking side by side with innovation, this approach is always at least one step behind. Even though blockchain technology is where the excitement and attention are today, it does not mean another technological discovery cannot take a leading position in the near future and throw away all the codifying and regulations set in place at that point.

Having this said, developing a taxonomy can help with the systematisation of dispute resolution proceedings – categories of smart contracts can produce a standardised approach to arbitration and, this way, a more consistent set of arbitration decisions. On the other hand, the lack of categorisation can be, on its own, a source of arbitration – "when the contract does not link to the project webpage, and there are neither comments in online forums nor the contract sources."⁶²

The smart contract's increasing automation level is the criteria we think works best for a taxonomy. This model is based on the notion that the long-form natural language contract retains its place and importance but that critical elements are "translated" into data points that trigger Smart Contract mechanisms.⁶³

Part of these disputes is straightforward enough to be better solved by AI or, in cases, slightly more complex, better solved by decentralised courts.⁶⁴ This solution claims to be a faster, less expensive, reliable, and decentralised way to solve disputes.⁶⁵ "Smarter contracts" reduce the amount of human administration, not necessarily the amount of human oversight or judgement.⁶⁶ However, this can raise the question of potentially conflicting with the New York Convention.

1.2.2: What constitutes a smart legal contract?

Smart contracts are written using a programming language. Therefore, they may serve as a stimulus to standardise the natural and programming languages⁶⁷ used in contract drafting.⁶⁸

⁶² Bartoletti and Pompianu "An empirical analysis", 9.

⁶³ Unsworth, "Smart Contract This!", 22-23.

⁶⁴ These are decentralised applications built on blockchain (mainly Ethereum) that, by relying on game theoretically incentives, have jurors solving the disputes.

⁶⁵ Lesaegre, Ast and George, *Kleros – Short Paper v1.0.7*, 1.

⁶⁶ Unsworth, "Smart Contract This!", 22-23.

⁶⁷ Programming languages use a formalised style, typically using mathematical symbols, computer science syntaxes, and in English. The use and understanding of English to code in the programming language is thus important and necessary.

⁶⁸ Fina and Ng, "Homogenization of Languages" 342.

While it is possible to transpose parts of the analysis to algorithmic and hybrid contracts at large, there is also the question of deciding where the 'split' between code and natural language should lie.⁶⁹

This dilemma is both legal and commercial. For example, the assessment of the risk appetite of the parties, the cost of insurance, the effectiveness, detail and flexibility of the automation, and the level of adaptation required by humans interacting with the machine.⁷⁰

The partial translation of a contract into code causes a loss of meaning to some degree, but this is not a new phenomenon – natural language drafting is not free from the risk of incorrectly reflecting a contracting party's intention.⁷¹ At the current stage of development and common acceptance of this new technology in the legal field, using natural language will still be necessary to comply with legal formalities – for compliance with signing and witnessing requirements, for example. However, it can be argued that parties can accomplish similar security in blockchain by using private keys, digital signatures, and multi-signature requirements. Further, all networked nodes can be said to act as 'witnesses', as the ledger will record the local copies of the transaction.^{72 73}

All this said does not mean the ideal situation would be to completely switch from traditional contracts to pure smart contracts – giving up on the ambiguity of the human language will bring certainty but also more conflict.

There is nothing to interpret in "if x, then y", – but being flexible with the execution of a contract with expressions such as "commercially reasonable manner" in common Law or "*bonus pater familias*" in European continental Law provides the parties with tools to solve conflicts without needing a court.⁷⁴ Furthermore, in this situation, a smart contract that does not need any push to be enforceable will, paradoxically, need a court to be solved.⁷⁵

⁶⁹ Rius, "Taxonomy", 132.

⁷⁰ Blycha and Garside, "Integration", 175.

⁷¹ Madir, "Legal Frameworks?", 10.

⁷² Rius, "Taxonomy", 133-134.

⁷³ As said before, in the absence of legislation reform, these formalities might obstruct the exploration of efficiencies in the setting.

⁷⁴ Raskin, "Legality", 324.

⁷⁵ Madir, "Legal Frameworks?", 4.

A broad draft of a term gives greater freedom to the party to decide how to achieve that term. On the other hand, if a party seeks greater certainty about how performance should be undertaken, the parties will prefer more precise language.⁷⁶

The digital transformation of contracts will be the most useful during the performance stage. Accurate translation is essential generally in contracting, but it will be crucial in a contract with blockchain ramifications. Translation can be defined as the equivalence and joint replacement between what is written in the smart contract code using computer coding languages with parameters and execution triggers - like Solidity - and the natural human language - like English – a mixture of legal terms and deal-specific terms. This equivalence must be functional, far more than just formal.⁷⁷

Formal equivalence is a translation matching form and content; functional equivalence creates the same effect on the target reader. All the targets - including the Distributed Ledger - must understand what is happening. Therefore, because it will be impossible to achieve complete functional equivalence between all languages, particularly clauses dealing with subjectivity elements⁷⁸, these should be excluded from translation into a smart legal contract.

It should also be patent in the traditional contract that the relevant smart legal contract acts as a translation of its equivalent natural language clause or as a performance mechanism previously agreed by the parties.⁷⁹ This will empower the parties to contractually agree on how to address specific issues concerning the performance and execution of the code and the use of automation as a feature of the contractual arrangements by both parties. For example, unilateral automation can be created to interact with a party's internal systems, in which such coded automation would necessarily be outside the scope of the legally enforceable contract.⁸⁰

⁷⁶ Blycha and Garside, "Integration", 175.

⁷⁷ Unsworth, "Smart Contract This!" 44. This idea was first developed by Eugene Nida and Charles Taber, *The Theory and Practice of Translation* (Leiden: Brill, 1969) 4th Edition.

⁷⁸ Unsworth, "Smart Contract This!" 44.

⁷⁹ Blycha and Garside, "Integration", 157.

⁸⁰ Wilkinson and Giuffre, "Six Levels", 187.

The incorporation of code into the contract has two reasons. First, to ensure that the coded obligations can be adequately translated to a natural language expression, thereby ensuring the contracting parties' understanding and intentions about the obligation's content. Secondly, for completeness and certainty as to which specific parts or operations of the smart legal contract are being referred to when the contracting parties' conjoin' a term or clause.

There should be dedicated extra attention when drafting interpretation provisions. For example, complex commercial contracts often include what may be an analogous mechanism: a 'priority', 'precedence', or 'hierarchy' clause setting out which of the provisions or documents incorporated into the contract are to prevail in the event of a conflict.⁸¹

⁸¹ Blycha and Garside, “Integration”, 165-169.

2. Smart Contracts and Arbitration

2.1 The Legal Challenges of SLC and Dispute Resolution

A traditional contract is an agreement the parties intend to be legally enforceable. So even though a smart contract, by definition, does not need additional enforceability, it does not mean the parties intended it to be outside of the law or to keep it from the remediation of the courts.⁸² So contract law does not have to be thought about differently just because this is connected to some innovative technology, even though we are dealing with new kinds of currencies and assets and new kinds of organisations.⁸³

Some authors argue that smart contracts will be an unfulfilled promise until they have a legal infrastructure. A legal foundation for smart contracts is desirable and essential; customers and investors must be able to invoke legal remedies and ensure a trustworthy functioning market.

Traditional legal frameworks, such as courts, arbitration or other settled alternative dispute resolution procedures, are more likely to be adopted because they are systems that give the parties significant legal certainty in the short to medium term.⁸⁴ However, alternative dispute resolution mechanisms are often discussed in the context of DLT-based smart legal contracts, as their increasing demand is a natural consequence of the rising digital economy. In high-value and complex disputes involving SLCs, parties want to guarantee a more vital dispute determination with clearly legally enforceable outcomes.

Choosing a system of law and arbitration or court process is critical for an effective dispute resolution process to produce a binding resolution.⁸⁵ The technological community needs both (i) a legal foundation and (ii) built-in dispute resolution.⁸⁶

2.1.1 Legal Form and Governing Law

The first issue that parties need to consider in this context is which legal form a smart contract has – a solution that can guarantee its validity and effectiveness. Meeting the

⁸² Madir, “Legal Frameworks?”, 2.

⁸³ Raskin, “Legality”, 306. This idea was first developed by Frank H. Easterbrook, “Cyberspace and the Law of the Horse” *University of Chicago Legal Forum* no. 207 (1996). [https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2147&context=jou](https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2147&context=journal_articles)
[nal_articles](https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2147&context=journal_articles)

⁸⁴ Morgan, Livingston, and Moir, “Dispute Resolution”, 437.

⁸⁵ Morgan, Livingston, and Moir, “Dispute Resolution”, 421-422.

⁸⁶ Vos, “End-to-End”, 58.

requirements of different jurisdictions can be proven problematic if the smart contract is written only in code, for example.⁸⁷ The fact that no defined system of rules applies to smart contracts is even more evident in Continental law jurisdictions like the European Union.

In Portuguese law, most Academia follows a contract structure which primarily includes an offer and its acceptance (articles 232° and 233° of the Portuguese Civil Code). The offer must be serious, complete, and precise enough to allow the counterpart to accept with a mere “yes” or an electronic tick in a box in case of e-contracts. Furthermore, acceptance should demonstrate the endorsement of the proposal’s comprehensive content.⁸⁸ But because the smart contract code only executes pre-coded actions, the assurance of contract performance does not classify as acceptance. The Portuguese Law of E-Commerce demands an interface to translate the acceptance into code. This way, the contract’s trustworthiness and intelligibility can be assured (article 33° (1) of the law of e-Commerce). The same applies to Spanish Law, for example, without much disparity.⁸⁹

With SCs, the existence of a contract depends on whether the blockchain has evidence of an offer and respective acceptance issued and received by the parties.

The declarations of intent occur via completing the respective actions on the interface. While the private key enables the party to access the system, the public key determines the declarant party from the receiver’s perspective. These declarations will only be binding from the point in time when the action has been “enchained” by the hash of a subsequent block. From then on, the transaction will be irrevocable and, therefore, binding.⁹⁰

The characteristics of smart contracts generate complex legal issues for private international law. One of the most used techniques in private international law is the conflict rule, which opens the possibility of locating a particular legal situation or relationship in a specific national legal system, providing an indirect answer to the question.⁹¹ In European Union Law, Rome I Regulation provides a solution by using the choice of law and habitual residence as connecting factors instead of relying on the place of conclusion or performance

⁸⁷ Morgan, Livingston, and Moir, “Dispute Resolution”, 439.

⁸⁸ Telles, *Manual*, 194.

⁸⁹ Faúndez, *Smart Contracts*, 67-72.

⁹⁰ Hoffmann, “Declarations of Intent”, 2.

⁹¹ Rodríguez, “Ley Aplicable”, 444.

of the contract. This solution works reasonably well in a more globalised and digitised society – if the parties follow the more cautious approach of writing the contract in a natural language, as previously described.

When a smart contract only exists in a programming language without supporting an underlying traditional contract, the applicable law must be determined solely based on the code. In this case, even though Rome I Regulation is still applicable, the opacity and anonymity of a blockchain raise practical concerns on whether connecting factors, such as the habitual residence of the ledger or service provider, will be enough.⁹²

The fact that smart contracts can behave proactively raises other questions: which part does the smart contract play? For example, it can send messages with data and therefore act as a contract initiator. It can also receive messages with data and therefore act as a contract receptor. In addition, it can act as a service provider and, in a certain way, act as an intermediary; it can perform the obligations written in the contract and adopt measures to cope with contract breaches without being a judge or an arbitrator.⁹³ A smart contract can even act as a custodian.⁹⁴ All these potential roles raise doubts about the intermediary role of these codes, and it is often not even possible to identify the defendant.⁹⁵

The principle of party autonomy (art. 3, Rome I) is the best way to guarantee the legal certainty of smart contracts – choosing the applicable law will avoid disputes about the legal framework and allows the parties to design their legal relationship that best suits their interests (art. 3(5) joined with art. 10(1), Rome I).

The applicable law can be chosen using a forum selection agreement inserted in the underlying contract that “backs” a smart contract, in the smart contract itself, or the general terms and conditions of the blockchain. The latter possibility is undoubtedly desirable, as it guarantees all actors operating in each network have the necessary legal certainty against

⁹² Rodríguez, “Ley Aplicable”, 447.

⁹³ Faúndez, *Smart Contracts*, 77-80.

⁹⁴ Peach, “Governance”, 14.

⁹⁵ Rodríguez, “Ley Aplicable”, 447.

unexpected legal requirements that invalidate the contract or make it unenforceable.^{96 97} Having this said, we follow Rodríguez (2021) on the understanding that the most practical and foreseeable solution in these cases, and the least arbitrary, is the application of the *lex fori*.

Without a globally uniform body of law, private international law can play a central role in the consolidation and development of smart contracting. The principle of party autonomy allows the parties to establish the applicable law, thus guaranteeing a minimum degree of legal certainty. It is also a principle that fits perfectly with the desire for individual freedom blockchain users seek. It implies leaving as much room as possible for party autonomy and promoting choice of law and submission agreements within the blockchain. At the same time, applying *lex fori* in the absence of choice, where the delocalisation of the transaction makes it impossible to reasonably establish the law of the country with the closest connections, is a solution that provides legal certainty and predictability.

Both solutions can also become incentives for the proper regulatory development of smart procurement. Regulators worldwide try to replicate the system they have for financial institutions and are taking notes of what other jurisdictions are doing.⁹⁸ Indeed, the parties tend to choose the system they consider most attractive for regulating their interests and often submit to what they consider the best court due to the advanced nature of its system. This takes place in a situation of regulatory competition between jurisdictions, which can ultimately lead to optimal legislative reforms.⁹⁹

There are several examples of legislative initiatives to regulate DAOs or DLT in general but attempts specifically concerning SCs are sparse.

In the EU, adopting Directive 2000/31/EC on certain legal aspects of information society services, in particular electronic commerce in the Internal Market, harmonised the Member States' framework on the topic. As a result, the EU will regulate the usage of smart contracts

⁹⁶ Rodríguez, "Ley Aplicable", 452.

⁹⁷ These agreements do not benefit from the protections of the "pro-arbitration" legal regime established by the NY Convention and contemporary arbitration legislation. These agreements are typically subjected to national law – the reason why we dedicate a few paragraphs to EU Regulation Rome I.

⁹⁸ Chapman KQ, "Rise of Cryptocurrency"

⁹⁹ Rodríguez, "Ley Aplicable", 453-454.

in the context of the data economy – the Data Act – establishing the first legal benchmark for smart contracts in the EU.¹⁰⁰ The Commission’s position is that smart contracts can be helpful in data sharing while still successfully protecting the data and the underlying database. In the proposed article 30 (1) of the draft, the Commission suggests four essential requirements for smart contracts for data sharing. First, smart contracts must be robust by offering high security against functional errors and third-party manipulation. Second, smart contracts must have a system to be safely terminated or interrupted so that the parties can reset or stop smart contracts from further execution.¹⁰¹ Third, it must be possible to archive transactional data by keeping a record of the operations performed on the data during a terminated smart contract. Lastly, a smart contract must have access control mechanisms at the governance and smart contract levels.¹⁰²

2.1.2 Jurisdiction and Procedure

Choosing the governing law and forum is fundamental in a cross-border agreement. It gives the parties certainty on which law to apply to their contractual obligations for service of process and whether arbitration or court proceedings should occur. This also avoids satellite disputes about the applicable seat and procedure law. Without an explicit written agreement that includes choice of law and dispute resolution provisions, there can be no binding referral of disputes to arbitration.¹⁰³

As explained before, because the nodes where smart contracts operate are based worldwide, it will be challenging to determine the competent jurisdiction. It is one of the few reasons why choosing a legal seat is a *sine qua non* condition for a fast and fair dispute resolution.

In practice, international contracts frequently contain “forum selection” or “choice of court” agreements, i.e. a provision whose purpose is to embody the contracting parties’ agreement on where to litigate a dispute and consider what will happen if a business relationship goes wrong. There are two options: (i) provisions that impose that a specified court solves the

¹⁰⁰ At time of writing, this EU regulation is a draft under public consultation on the European Commission’s website.

¹⁰¹ On this specific point, even though in a traditional approach to contract law this would be an obvious requirement, for smart contracts it can defeat the whole purpose of using smart contracts – the fact that they are unstoppable.

¹⁰² European Commission, Data Act draft, 57-58.

¹⁰³ Morgan, Livingston, and Moir, “Dispute Resolution”, 440-445.

dispute without excluding litigation in other forums, or (ii) provisions imposing litigation in specified courts waiving any right to litigate in any other forum.

A forum selection clause is not an arbitration agreement because a forum selection clause provides for the resolution of disputes by litigation in a national court.¹⁰⁴ Alternatively, in the case of arbitration before a non-governmental arbitrator selected by or for the parties, parties seek a dispute resolution mechanism that can lead to a binding and enforceable arbitration award under the New York Convention.¹⁰⁵

Engaging in forum shopping raises the risk of multiple parallel cases, conflicting outcomes and reduction of predictability, which is precisely what corporate parties seek. The best way to do that is by including a dispute resolution clause in the contract.¹⁰⁶

There are several synonyms for the concept of “legal seat”: the “place of arbitration”, the “juridical home”, where the award is “made”. Traditionally, the main reasons appointed to emphasise the importance of the seat are the possibility of determining the law applicable to the arbitration agreement, but primarily for determining the applicable arbitration law and which courts are “competent” to annul/set aside/vacate an award.¹⁰⁷ The courts in the legal seat have unique competencies: issuing anti-arbitration injunctions, assisting in document production or obtaining an interlocutory or interim order.¹⁰⁸

Even though it sounds like a physical location, one crucial thing to notice is that arbitrators can change where hearings occur but cannot change the legal seat. This is especially important regarding online hearings – it has legal implications where the tribunal is but has no implication where the hearings occur.¹⁰⁹ Furthermore, the seat of arbitration will determine the arbitrability of the subject matter of the dispute. Some jurisdictions are not “arbitration-friendly” as they have laws restricting party autonomy, such as allowing the

¹⁰⁴ Born, “International Arbitration”, 4-5.

¹⁰⁵ United Nations Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York, 10 June 1958) also known as the “New York Arbitration Convention” or the “New York Convention”, is one of the key instruments in international arbitration.

¹⁰⁶ Rogers and Benedettelli, “Introduction to Cross-Border Disputes”

¹⁰⁷ Only the courts in the seat can annul the award. This is different than enforce or not an award.

¹⁰⁸ Worth mentioning that the extent of Court intervention can be specified in the agreement. The rules of most arbitral institutions provide for circumstances where a national court may intervene, but these standard provisions may not suit the parties.

¹⁰⁹ Rogers and Benedettelli, “Legal Frameworks”

courts to intervene extensively in the arbitral process. More, the extent to which judicial review is available to parties will depend on the law of the seat of arbitration.¹¹⁰

Parties should check if the law of the chosen seat renders a smart contract illegal or unenforceable. It must be a “defined legal relationship”, the disputes likely to arise must be arbitrable, and the codified arbitration agreement in question must be upheld and enforced by the supervisory courts (art. II(1) and (3) of the NY Convention).¹¹¹

Even though article II(1) and (2) of the NY Convention was drafted long before the widening use of electronic commerce, disputes involving any technology are welcome in domestic legislation and case law. Accordingly, the recommended interpretation adopted by UNCITRAL¹¹² is that the article should be subjected to extensive interpretation concerning formal requirements to provide the possibility of arbitration agreements, arbitration proceedings, and the enforcement of arbitral awards.¹¹³

Even though the choice of a Legal Seat ends up being practical, it is ironic how the New York Convention only mentions it indirectly: art. I (1) refers to awards “made in the territory of a State other than the State where the recognition and enforcement”, art. I (3) refers to awards “made in territory of another contracting State” and art. V (1) (e) mentions “the country in which ... that award was made”. We can probably assume that, indirectly, this ethereal mention of the legal seat is also what makes arbitration agreements possible.

Article II of the NY Convention also requires an agreement to arbitrate in writing and to be signed unless it is in the form of an “exchange of letters or telegrams”. However, the definition of “an agreement in writing” and “signing” is interpreted differently across the various jurisdictions. Therefore, as discussed before, smart contracts might not be enforced under the NY Convention unless both parties have signed an equivalent traditional word-format contract.¹¹⁴

¹¹⁰ Shehata, “Arbitration of Smart Contracts Part 3”

¹¹¹ Rogers, Jones-Fenlegh and Sanitt, “Disputes”, 21–24.

¹¹² The United Nations Commission on International Trade Law (UNCITRAL) is the core legal body of the United Nations system in the field of international trade law. A legal body with universal membership specializing in commercial law reform focusing on the modernization and harmonization of rules on international business.

¹¹³ Rogers and Benedettelli, “Cross-Border Disputes”

¹¹⁴ Shehata, “Arbitration of Smart Contracts Part 3”

2.1.3 Modification and Performance

The immutability of smart contracts is contranatural for the traditional contract theory. However, at the same time, immutability is one of the reasons a party would want to use smart contracts as part of an operation or as an ancillary contract.

There are a few proposals on how an SLC can be updated to incorporate changes. It is undeniable how these types of solutions would benefit the use of the technology. Psychologically, the complete immutability of an action plays a role in wanting to avoid that action altogether. A modification mechanism backed by the evolving legal landscape can make this technology more desirable.

There are a few appointed options, but they would mainly function *ex post* when a conflict has already erupted. For example, one option could be adding *force Majeure* clauses¹¹⁵ as part of the smart legal contract.¹¹⁶ This solution is, however, difficult to achieve due to the ambiguity and impreciseness of the terms. Moreover, if not included in the code itself, it would not stop the performance of the smart contract at all, only possibly providing *ex post* remedies.

Another method would be by previously adding a clause for mandatory periodic review of the terms of the contract, putting the burden on the parties or their agents to update the code. This way, there is no need to rely on the third-party government to create a new infrastructure. In case of revision of the regulation or new regulation, the contract terms can still be in place, and the business relationship can continue.¹¹⁷

Either way, we think there is a need for governance mechanisms in the natural language over the status and effect of SLCs' coded elements. These mechanisms would focus on enhancing the interconnection between natural language and code, and this way, increase the drafter's

¹¹⁵ *Force majeure* is a contract clause used to withdraw liability in case of an interruption of the predictable course of events by "unforeseeable and unavoidable catastrophes" that therefore prevent participants from fulfilling obligations. The origin of this concept goes back to French civil law and is standard in many jurisdictions that derive their legal systems from the Napoleonic Code. In common law systems, such as those of the US or the UK, force majeure clauses are acceptable but must be quite explicit and detailed on what would trigger the clause. These clauses generally cover natural disasters, as well as human actions, such as armed conflict and man-made diseases. As time goes on, there have raised questions about what is and is not foreseeable in a legal sense. Natural disasters are now foreseeable to an extent, but there are developing new human threats, such as cyber, nuclear, and biological warfare capabilities. For more detail: https://www.law.cornell.edu/wex/force_majeure

¹¹⁶ Werbach and Cornell, "*ex machina*", 155.

¹¹⁷ Raskin, "Legality", 327.

aptitude to ensure the intended agreement of the parties is unaffected but ultimately improved by the inclusion of code.

The solution could be the establishment of some kind of a smart legal contract model. This would result in a viable legal contract with enhanced functional (“smart”) capabilities that digitally automate the performance of certain rights and obligations by including coded instructions. A smart legal contract is a governance tool that needs to support the methodologies of both the legal and digital domains and their respective languages while maintaining effectiveness in both.¹¹⁸ In other cases, parties may wish to alter a contract before the performance strategically.¹¹⁹

With this approach, human intervention will be more limited after the contract conclusion. The need to assert rights post-closure will be reduced because the computer will simply do what it has been programmed to do at the outset.¹²⁰

2.1.4 Capacity of the Parties

DLT platforms and smart contracts are potentially open to pseudonymous parties, who do not usually confirm their capacity at the outset, which causes additional difficulties. Most jurisdictions would recognise a contract as legally binding only if the parties can perform their obligations. If the parties lack legal capacity, such contracts will be considered invalid in traditional disputes and online dispute resolution proceedings, which may enable parties to evade their obligations.¹²¹ Further, it might serve such a party as a legal loophole to evade its future obligations under the smart contract.¹²²

Parties should be aware that the law of the domicile of each party usually determines their legal capacity, not the law of the seat of arbitration or any other law. Therefore, if one of the parties comes from a jurisdiction that does not recognise smart contracts, this might affect a party’s ability to enter into the contract.

¹¹⁸ Blycha and Garside, “Integration”, 143-145.

¹¹⁹ Werbach, Cornell, “*ex machina*”, 155.

¹²⁰ Unsworth, “Smart Contract This!”, 21.

¹²¹ Morgan, Livingston, and Moir, “Dispute Resolution”, 440.

¹²² Shehata, “Arbitration of Smart Contracts Part 3”

Apart from the capacity to perform obligations, we should also consider that parties should ensure they can establish consent to the arbitration agreement. We will address the implications in chapter 3.2.

2.1.5 Liability and Enforcement

Parties should guarantee the formality standards of the arbitration agreement under the governing law of the arbitration agreement and smart contract, the law of the seat and wherever the award is likely to be enforced. However, at this stage of smart contracts arbitration disputes development, an arbitration agreement in code, or incorporated by code, may not meet the requirements for writing under the New York Convention of 1958.¹²³

Whether a platform or a protocol is centralised or decentralised raises the question of identifying whom to sue – whether liability can be attributed to individuals or entities. How a judgement or an arbitration award is enforced – against the smart contract creator, the smart contract owner (issuer?), or the platform – depends on where the parties are looking to enforce and whether they seek enforcement of the arbitration award in fiat currency or cryptocurrency.¹²⁴

There may also be difficulties in pinpointing who is responsible for the loss caused by operating system bugs, corrupted messages or defective code.¹²⁵

2.2 Arbitration Clauses

Dispute resolution clauses are often called the “midnight clause”, meaning “the clause that is pushed to the very end of the agreement and considered, briefly, at the end of contract negotiations”. If poorly drafted and full of defects, this clause may be found unenforceable – a so-called “pathological clause”.^{126 127} A defaulting party can use these “pathogens” to delay the arbitral process; therefore, they should exercise care so the scope of the arbitration is not unnecessarily limited. A “pathological clause” could be, for example, about the

¹²³ Rogers, Jones-Fenleigh and Sanitt, “Disputes”, 21–24.

¹²⁴ Chapman KQ, “Rise of Cryptocurrency”

¹²⁵ Rogers, Jones-Fenleigh and Sanitt, “Disputes”, 21–24.

¹²⁶ However, if drafted too carefully, their very enforceability raises some unexpected results. The enforceability of complex arbitration clauses, when tested before arbitrators and in State court, shows the limits and the risks of the parties’ possibilities in designing their dispute resolution mechanism.

¹²⁷ Willems, “The Arbitrator’s Jurisdiction”, 2.

incorrect or ambiguous description of the seat of the arbitration. The effect is a collateral dispute regarding the arbitration seat that must be resolved by the arbitrator or a court, adding costs to the arbitration. Other frequent errors are parties failing to specify the applicable procedural rules, the number of arbitrators and the applicable substantive law. Such defects would mean that the parties must have the issues decided by a state court. Generally, State courts can solve issues regarding pathogens; however, these are costs and delays that lessen the efficacy of dispute resolution via arbitration.

First, it is imperative to establish the scope of the arbitration clause in respect of the parties concerned with the agreement. In agreements where sub-contractors are concerned, such as app developers, providing for all parties to the agreement to be in the scope will be helpful. The clause should also account for the possibility of consolidating into a single hearing multiple arbitrations concerning the exact cause of action or the same subject matter. It is also essential to specify the language of the proceedings, especially in cases transnational by default, to provide coherence.¹²⁸

The clause should also specify the number of arbitrators, which procedures to follow and what substantive law to apply. The parties may choose between *ad hoc* arbitration or institutional arbitration. The first is a form of arbitration where the parties and the arbitrators independently determine the procedure; the second is to request the specialised services of an arbitration institution. The various arbitration institutions have their arbitration procedures, including the appointment of arbitrators. The default scenario is that whatever is not specified in the arbitration clause, the institution's rules will prevail. Parties should, however, evaluate the importance of having a tribunal familiar with the technology against the importance of having the dispute decided by experienced contract lawyers. There is likely to be little overlap between the two, so requiring both skills sets risks restricting the pool of potential arbitrators to such an extent that the arbitration agreement becomes unworkable.¹²⁹

The parties must be cognizant of the definitiveness and bindingness of the arbitrator's award. Apart from specific jurisdictions that want to be more suitable for international arbitration

¹²⁸ Lestrade, "Arbitration Clauses", 4-6.

¹²⁹ Rogers, Jones-Fenleigh and Sanitt, "Disputes", 21-24.

cases, awards have a minimal right of appeal or review. States that have signed the New York Convention have minimal scope to review international arbitration awards and are compelled to order a stay of all proceedings contravening the provisions of international arbitration clauses.¹³⁰ Finally, parties must be aware that confidentiality is not necessarily by default. If that is the case, the parties should expressly agree in the arbitration agreement that they will keep the arbitration, together with all materials created and all documents produced in the proceedings, confidential, except to the extent required for enforcement.¹³¹

With the recent developments with ChatGPT, the use of AI in the legal field, including in drafting contracts and dispute resolution provisions, is rapidly developing. For example, the use of AI in drafting arbitration clauses raises several implications, including the need to consider the reliability and accuracy of AI-generated language, the transparency and accountability of AI decision-making processes, and the potential for bias or discrimination. Additionally, the enforceability of AI-generated contracts and clauses may be an issue, particularly in the absence of clear legal precedents or guidelines, such as articles II (ii) and (iii) of the NY Convention. These and other implications will likely be the subject of ongoing debate and research as the use of AI in the legal field continues to evolve.

In the specific case of smart legal contracts, the contract should also include provisions for managing the risks of automation or reliance on data to trigger performance. These can provide a method for contracting parties to manage risk through the SLC and facilitate effective dispute resolution.¹³² The UNCITRAL Working Group recommends that the focus should not be on developing a new set of rules but on preparing model clauses, which disputing parties can easily refer to or include in their dispute resolution clause. The tech industry tends to perceive the current frameworks for alternative dispute resolution as not providing an adequate solution when the resources are underutilised. The development of such model clauses would respond to the needs of the industry.¹³³ Especially in the EU states where alternative dispute resolution has not been widely practised, it has become clear that

¹³⁰ Lestrade, “Arbitration Clauses”, 4.

¹³¹ Rogers, Jones-Fenleigh and Sanitt, “Disputes”, 21–24.

¹³² Blycha, Horrigan and García-Perrote, “Impact”, 6-7.

¹³³ UNCITRAL Working Group II “Draft Provisions”, 4-5.

the careful and skilful drafting of the arbitration clause is crucial to evading severe problems concerning its effectiveness.¹³⁴

Courts and arbitral tribunals may need new civil procedure rules governing their access to digital platforms and the ability to make the corresponding rulings affecting code. In sum, the growth of SLCs will require adaptation by the legal profession and modification of approaches to dispute resolution, but one which is not a whole-cloth reinvention but rather a modification and supplementation of existing rules and procedures.¹³⁵

¹³⁴ Lestrade, “Arbitration Clauses”, 1.

¹³⁵ Blycha, Horrigan and García-Perrote, “Impact”, 6-7.

3. International Arbitration Legal Framework

3.1 Arbitral Proceedings

The parties can decide whether the arbitration procedure will be "ad hoc", meaning they decide on the procedure of arbitration proceedings or "institutional", where the institution sets the procedures specialised in arbitration and mediation proceedings.¹³⁶

If the parties have chosen institutional arbitration, the seat of arbitration usually is where the institution has its headquarters. The arbitral institution's rules can be used expressly or by default, depending on the agreement's provisions for arbitration services. In *ad hoc* arbitration, the parties can decide where the arbitral proceedings will be conducted and choose which rules of procedure suit the case better.

The drafter of the rules clause should be a lawyer familiar with the rules of the more reputable arbitral courts/ or institutions and also the procedural rules of the national courts which may have review jurisdiction over the dispute, and the procedural rules of the place/ country where the arbitration is seated.¹³⁷

In cases evolving SLCs, not all proceedings need to be reviewed to the core; some will function similarly to any other dispute. However, parts of the proceedings will suffer some changes due to the specificities of this technology – interim measures and the treatment of digital blockchain evidence. We will then address the challenges arbitration awards involving SLCs might encounter regarding recognition and enforcement.

3.1.1 Interim Measures

Article 26 (2) of the UNCITRAL Arbitration Rules defines interim measure as any temporary measure, whether in the form of an award or in another form, by which, at any time prior to the issuance of the award, the dispute is finally decided. The arbitral tribunal orders a party to preserve the *status quo*, prevent irreparable harm to a right or the destruction of goods, provide a means of preserving assets or preserve evidence that may be relevant and material to the resolution of the dispute. It can be an essential tool in international arbitration, as it allows the parties to take immediate action to protect their rights and assets while the dispute is resolved.

¹³⁶ The parties are normally free to alter the procedures for their specific case, where the institution is agreeable.

¹³⁷ Lestrade, "Arbitration Clauses", 3.

When seeking interim relief, the parties can request it from the national courts of the jurisdiction, go to emergency arbitration or an arbitral tribunal and ask them, at the beginning of the proceedings, to issue interim relief.¹³⁸

It is debated whether provisional measures granted by an arbitral tribunal can be recognised and enforced according to the New York Convention. Some authors see here a mandatory formal requirement that the provisional measure must be an award.¹³⁹ Other authors take the opposite position, noting that the substance of the decision plays a more significant role: under Art. V of the NY Convention, provisional measures are, by definition, temporary and revocable, lacking the finality which typifies awards, making interim measures incompatible with the treaty regime.¹⁴⁰

It has also been argued that the recognition and enforcement of provisional measures could be justified based on an autonomous interpretation of the notion of award under the New York Convention. Its overall objective of promoting the effectiveness of international arbitration could result from applying a domestic "more favourable" provision within the meaning of Art. VII of the New York Convention.¹⁴¹

Most arbitral agreements are considered broad enough to grant this kind of relief, but the wording used is crucial for its applicability: "...all disputes arising out of or in connection with..." is an example of a good choice of wording in an arbitration clause. Interim relief is in connection with the case, and its request from the arbitral tribunal is allowed. If instead, the measure was requested from the courts of the seat, they can say that, according to the NY Convention, the case must be sent back to arbitration.

Ideally, parties should directly include: (i) a provision enabling the automatic adoption of interim measures (for example, suspension of performance of obligations under a smart contract, blocking of funds)¹⁴² and (ii) expressly agree that, despite this arbitration agreement, the parties shall be entitled at any time, both before and after the arbitration

¹³⁸ Rogers and Benedettelli, "Interim Measures and Emergency Arbitration"

¹³⁹ Carlevaris, "L'impugnazione dei lodi arbitrali". <https://hdl.handle.net/11562/1044196>

¹⁴⁰ P. Bernardini, "Riconoscimento ed esecuzione dei lodi stranieri in Italia" *Rivista dell'arbitrato*, 2010, 433.

¹⁴¹ Benedettelli, "International Arbitration", 249-250.

¹⁴² Kasatkina, "Dispute Resolution Mechanism", 14.

tribunal has been established, to seek urgent interim relief or measures of protection from a competent national court.

This right to apply to a national court for interim relief is without prejudice to any right to apply for such relief to the arbitration tribunal.¹⁴³

However, in practice, even if the relevant court is favourable to the application of an interim measure issued by an arbitral tribunal, the party seeking such a measure should not leave the formal requirement, meaning, the injunctive measure in the form of an award, unattended to increase the probability of enforcement. In the case of smart legal contracts, the measures will consist of an injunction to prevent the SLC from performing or the payment of a fine for each day the debtor delays compliance with the judgment. However, the effectiveness of an injunctive relief mainly depends on the tools available in each jurisdiction to force compliance with the judicial injunction or to sanction a party's failure to comply.¹⁴⁴ The role of courts in handling disputes in the digital economy has been highlighted, particularly concerning cross-border enforcement of interim measures to preserve assets or evidence, possibly in their digital form.¹⁴⁵

No specific procedures focus on interim relief regarding smart legal contracts in the UKJT Digital Dispute Resolution Rules, the SAMS Rules Governing Disputes arising out of Smart Contracts, International Chamber of Commerce Arbitration Rules or the UNCITRAL Draft Provisions for Technology-related Dispute Resolution. However, it is worth noting that an interim measure to prevent the performance of a SLC might be provoked by several reasons not connected to the parties' will to comply with their contractual obligations – it might be due to a code bug, a change in the applicable regulation or any other technological technicality.

Parties seeking interim relief should also consider whether the measure requested from the arbitral tribunal constitutes a known form of relief in the places of enforcement. The non-availability of a particular type of relief, such as stopping an automated contract to perform or any associated pecuniary sanction for non-compliance in the place of enforcement, raises concerns regarding the compatibility of the interim measure order issued by the arbitral

¹⁴³ Rogers and Benedettelli, "Interim Measures and Emergency Arbitration"

¹⁴⁴ Castello and Chahine, "Enforcement of Interim Measures"

¹⁴⁵ UNCITRAL, "Report of the Colloquium", 6.

tribunal with the public policy of the place of enforcement. As a result, there is a high probability that enforcement will be refused.

For instance, in a smart legal contract with a code bug that triggers its performance in an unintended damaging way to the parties, the interim measure is to prevent the performance hence the damage. However, the blockchain services might be outsourced, which means the IR will seek relief against a third party – request the programmer or the company who provides the service to mitigate the damage using their technical expertise. An anti-suit injunction to seek relief against a third party issued by the arbitral tribunal can be unconstitutional in certain jurisdictions and thus that country's public policy. In the same vein, some jurisdictions consider that disproportionate damages are contrary to their international public policy and may thus frown on interim measures accompanied by hefty sanctions in the case of non-compliance.¹⁴⁶

Without the possibility of modifying the SLC, the payment of a fine for each day the debtor delays compliance with the judgment ends up being the most obvious solution.¹⁴⁷ There is the question of whether this claim for extra damages should be made before the arbitral tribunal that issued the interim measure or before the country's courts where this order was enforced (and not complied with).¹⁴⁸

As mentioned earlier in this chapter, "on-chain" arbitration might bring exciting solutions to the table in the context of IR. They function as an update to the traditional off-chain arbitration while complying with the UNCITRAL Arbitration Rules by automating some aspects of the proceedings. For example, the decision might be traditionally or automatically executed with a smart contract.

The Juris Protocol Mediation and Arbitration, the basis of the Juris Project, is a blockchain-based system built for smart contracts that ensure they are legally enforceable and backs them up with a dispute resolution system powered by human mediators and arbitrators all

¹⁴⁶ Castello and Chahine, "Enforcement of Interim Measures"

¹⁴⁷ This mechanism does not exist in common law but does in most civil law jurisdictions. For instance, in France, a judge can order an "astreinte" or "non-compliance penalty". The Netherlands and Italy have similar mechanisms. In Germany courts have a similar mechanism, although the fine is paid to the state and not to the petitioner.

¹⁴⁸ Castello and Chahine, "Enforcement of Interim Measures"

over the world. A prerequisite for accessing the dispute resolution system is the pre-existence of an arbitration agreement integrated into smart contract via a coded clause. A smart contract is protected by the Juris Protocol when the Juris CDK code is included in the contract and backed by the attachment of a small quantity of Juris Token (JRS). The CDK provides for a minimum subset of "just in case" contract terms in the form of code to be included in the smart contract.¹⁴⁹ In case of a dispute, one of the parties files a formal complaint through the platform, triggering the system to suspend the smart contract from further execution. The platform then automatically notifies the other party about the dispute.

The suspension of the smart contract can be, in practice, a preventive measure to avoid further harm, even though the platform does not call this suspension an interim measure. Also, this is an automatic feature, not decided by an arbitrator. However, it is revocable and temporary, and the reasons why the arbitration was triggered and, therefore, the smart contract was suspended, can be further discussed in the procedure. It prevents the involvement of national courts at an earlier stage of the arbitration without compromising the fairness and justice of the trial. Although it is not intended, in the specific case of an SLC, we can also argue that it can prevent harm to the contract caused by a third party in case of hacking the blockchain. However, this is not a feature of this service – it is an alternative dispute resolution platform, not a cybersecurity service.

Further analysis of the platform and the enforcement of related decisions will be discussed in the next chapter.

3.1.2 Treatment of Digital Evidence

The value of blockchain evidence arises from its immutability, encryption and time-stamping features. However, even though blockchain has an undisputed impact on dispute resolution mechanisms, authors still disagree on its admissibility as evidence in litigation to find it virtually useless if unreliable in court.¹⁵⁰

The impact of the digital audit trail on the performance of an SLC over time as evidence strengthens the debate about the arguable insufficiency of procedure and evidence law and the need for enhanced rules of evidence to respond to the impact of digitalisation¹⁵¹

¹⁴⁹ Kerpelman, "A Non-Technical Overview"

¹⁵⁰ Álvarez, Vidal and Vallespinós, "Unlocking Blockchain Evidence", 7.

¹⁵¹ Blycha, Horrigan and García-Perrote, "Impact", 6-7.

Aside from the smart contract, data registration as evidence in the blockchain can work pre and post-arbitration proceedings. Pre-arbitration as an authentication system. The information produced outside and then deployed on the blockchain considerably impacts the pre-constitution of evidence. Post-arbitration is through the transaction receipt in an unchangeable database, such as blockchain, as it is tracked, validated, registered and time-stamped in the chain through a hash. Its admissibility as evidence by the tribunal verifies the transaction's time, place and nature.¹⁵²

Precisely because it is a new type of digital evidence, aligned with the technical knowledge required to interpret it, there is much uncertainty about how digital evidence can be presented in court. Not many countries have adopted measures to guarantee the validity of blockchain data as evidence in court apart from China¹⁵³, which was the first to establish the requirements for its admissibility in court. In the EU, Italy¹⁵⁴ adopted a law regulating the admissibility of blockchain data as evidence. By presenting the hash alongside an expert certification, data stored in distributed ledgers like blockchain must have the same legal treatment granted to electronic time stamps as defined by EU Regulation 919/2014 on electronic identification and trust services for electronic transactions ("eIDAS").¹⁵⁵

Another weakness pointed out by lawmakers, law practitioners and courts, partially due to a lack of understanding of how the technology works, is the distrust in the blockchain immutability features. In a cybersecurity breach affecting 51% of these nodes, the blockchain information could be corrupted since validation of data on the blockchain depends on the decision of most nodes. It is important to raise questions like this hypothetical situation, but this is highly unlikely, especially in public blockchains such as Ethereum. In a private blockchain with few nodes, the probability is, in fact, higher, and the breach will depend on the hacker's probative capacity and the platform's probative value. The practical differences are substantial enough to admit different rules for both types of blockchains. What we believe should not happen to provide justice and conflict resolution to those seeking it is completely disregarding such evidence.

¹⁵² Álvarez, Vidal and Vallespinós, "Unlocking Blockchain Evidence", 7-8.

¹⁵³ Chan, "Evidence in Internet Courts in China"

¹⁵⁴ Sarzana, "la legge"

¹⁵⁵ Barbet-Massin, "Reflections"

In order to fully take advantage of this new, more efficient technology, it is critical that lawmakers, lawyers and arbitration institutions understand its value as a reliable source of information, but most importantly, adapt the existing framework of traditional procedural law, usually based on documentary evidence, to be more digital-friendly.

In the context of arbitration, there have been developed a few rules. For instance, JAMS, one of the biggest private alternative dispute resolution providers, published the "JAMS Smart Contract Clause and Rules" draft rules for disputes arising from smart contracts. According to these rules, an expert witness is called for disposition on the meaning of the code. The arbitrator's review of evidence is limited to that deposition, the code, any wrapper contract and witness evidence.¹⁵⁶

The ICC, on the other hand, even though it does not provide such a straightforward procedure, gives insightful guidelines on the matter. Party's autonomy when it comes to the use of IT for a party's internal purposes is permissible; however, it may be subject to limitations where data is to be exchanged or used by other participants in the process, as in the document disclosure phase. Further, a tribunal may consider it appropriate to require that data be produced in the arbitration in a format that (i) is reasonably accessible to other participants, (ii) takes into account time and cost factors, and (iii) facilitates and does not impede the review process.¹⁵⁷

Apart from the admissibility of the evidence, some questions might raise regarding its confidentiality. First, the large and complex disputes that these parties submit to international arbitration frequently involve valuable confidential data and require evidence of non-public facts that may have the potential to influence politics and financial markets. Second, a key advantage of international arbitration compared to litigation in national courts is arbitration's potential to be a confidential forum. Finally, although the level and scope of confidentiality are variable, some aspects of the arbitration, such as arbitrator deliberations, always are confidential.

¹⁵⁶ Rule 13 (c), JAMS Rules.

¹⁵⁷ ICC Commission Report, "Leveraging Technology", 9.

The legal industry has become a prime target for cybersecurity attacks. Lawyers hold valuable clients and information that hackers are motivated to monetise or use for other unauthorised purposes, often causing significant damage to those whose data is illicitly obtained. Cybersecurity protection is critical to maintaining international arbitration's advantages over litigation.

Third, international arbitration involves actors from different jurisdictions operating from various settings and extensive communications and data transmission. Parties are typically represented by large and often cross-firm/cross-border teams whose cybersecurity and safety practices and technologies may not be fully harmonised.

Blockchain guarantees the data's anonymity. Unauthorised intrusion threatens more than confidentiality and privacy expectations; it directly threatens the fair, neutral, and orderly process that underlies all arbitrations and public trust in the arbitral process. Arbitral participants must take reasonable measures to prevent digital intrusion into the arbitral process and may suggest or require that matters of cybersecurity and personal data protection be considered early in the proceedings. Most cybersecurity breaches involve human error, and any arbitral participant may cause a breach, irrespective of the size or sophistication of the practice setting in which he or she works.

Proactive attention to cybersecurity and data privacy is required to ensure that international arbitration maintains its advantage over cross-border litigation as a sophisticated, more private, and confidential forum to resolve complex commercial disputes.¹⁵⁸

3.2 Recognition and Enforcement of an International Arbitral Award

Art. I (1) of the NY Convention does not clarify the concept of "arbitral award" since Art. I (2) simply state that the scope of the treaty includes not only awards "made by arbitrators appointed for each case" but also awards "made by permanent arbitral bodies to which the parties have submitted". So, a definition of arbitral award is possible; it should consider the provisions of Art. V of the NY Convention concerning the conditions for recognition and enforcement, its system and purpose and the contracting States' practice.

¹⁵⁸ ICC Commission Report, "Leveraging Technology", 11-12.

From this perspective, there are three mandatory requirements. First, a positive delimitation of the scope of an award: the award must have been judged in arbitral proceedings instituted based on the parties' agreement as oppose to "mandatory" arbitrations where the power of the arbitral tribunals derives from the law falling outside the scope of the NY Convention.

Second, the negative delimitation of an award: the arbitration must intend the settlement of a legal dispute. Other categories of decisions or settlements agreed by the parties during the arbitration and not incorporated into an "award by consent" cannot be characterised as awards.

Third, the award must be final, which means the arbitral tribunal can no longer modify the ruling. Orders issued throughout the proceedings, such as orders granting interim or protective measures and decisions issued within emergency arbitral proceedings, should not qualify as awards.¹⁵⁹

However, some jurisdictions have in their national legislation the rule that recognises and enforce provisional measures ordered in a foreign arbitration in the form of an award. In Portugal, article 27 (4) of the Law on Voluntary Arbitration addresses this type of decision as "awards" throughout the whole diploma and does not concede the parties' right to appeal that decision, not its own, only in connection with the arbitral award that addresses the main claim. The same happens in Spain and Italy.¹⁶⁰

Considering the criteria set out above, interim awards can be characterised as awards for the NY Convention and can be recognised independently if the national legislation classifies them as final.

In most cases, parties voluntarily comply with arbitration awards. This issue arises if a losing party seeks to annul the award in the arbitral seat or fails to comply with the award and the winning party starts an enforcement proceeding outside the seat under the NY Convention. Since 1958 when it was adopted, the key criteria to determine the enforceability of arbitral

¹⁵⁹ Benedettelli, "International Arbitration", 358.

¹⁶⁰ For an analysis of the interpretation of Italian courts: Benedettelli, "International Arbitration", 366, §9.16-§9.19.

awards concerned the fundamental requirements of due process and not a review of the substantive merits of the decision.¹⁶¹

Article III of the Convention provides that signatories' courts "shall recognise arbitral awards as binding and enforce them (...) subject to the conditions laid down".

Article V further provides that if a party seeks to enforce a foreign arbitral award, the losing party has the burden of proving that the award should not be enforced. The court may refuse to enforce the award "only" based on a set of grounds specified in the Convention.¹⁶²

Those grounds are related to the arbitration agreement itself, such as the legal incapacity to consent to an arbitration agreement, the invalidity of the arbitration agreement under its governing law¹⁶³, or the invalidity of the overall procedure. It can include cases where the arbitral award covers topics out of the scope of the tribunal's competence, cases where the arbitral award has not yet become binding or has been suspended or dismissed by a competent authority¹⁶⁴, the matter of the conflict is excluded from arbitration, the award is contrary to public policy, and the procedure was considered unsuitable or unfair.¹⁶⁵ The latter will be addressed in chapter 4.1.

Generally, the grounds above are relatively uncontroversial and straightforward bases for courts to consider whether to refuse the enforcement of arbitral awards. Further, because these grounds mainly concern fundamental requirements of international arbitration and due process, the absence of which often would halt arbitral proceedings well before the award enforcement stage, the award-debtor typically has the burden to prove that the grounds apply. In short, while award debtors sometimes try to resist foreign arbitral awards on the grounds above, they usually lose, and the awards are enforced.¹⁶⁶

¹⁶¹ Greer, "New Approaches".

¹⁶² Greer, "Enforcement of Foreign Arbitral Awards".

¹⁶³ This was addressed in chapter 3.2.

¹⁶⁴ This ground will not bring any special differences in cases regarding smart legal contracts. For that matter, it will not be addressed in this dissertation.

¹⁶⁵ Lestrade, "Arbitration Clauses", 2.

¹⁶⁶ Greer, "Enforcement of Foreign Arbitral Awards".

3.2.1: No enforcement stems from the arbitration agreement

In cases of invalidity of the arbitration agreement under its governing law, the arbitration award might also be invalid. Various circumstances could trigger this situation, most of them shared with traditional contracts. But what could be different in the contract of SLCs is the invalidity of the smart legal contract with an attached coded arbitration clause. Can the doctrine of separability still be applied?

The doctrine of separability is a legal fiction that separates the underlying contract from its arbitration clause. As such, the arbitration clause survives the underlying contract's termination, breach and invalidity.¹⁶⁷

Without this doctrine, if the underlying contract was illegal and the arbitrators took the case nonetheless, their decision would not have a binding effect because the contract that gives them their arbitration jurisdiction is illegal and disappears along with the underlying contract.

So, treating that obligation to arbitrate separately from the underlying contract allows the arbitrators to decide whether the underlying contract is illegal or has been terminated.¹⁶⁸

Some authors acknowledge that the contract and the arbitration agreement may be subject to different laws based on the concept of separability, which assumes that the two agreements are distinct and can be governed by different legal frameworks.¹⁶⁹ Other authors, however, have a restrictive interpretation of this doctrine: it is only applied when the underlying contract is invalid, but the arbitration agreement remains intact. In other words, the purpose of this doctrine is to preserve an arbitral tribunal's jurisdiction by enforcing the parties' agreement to arbitrate, distinct from the main agreement generally, including determining the proper law of arbitration agreement.¹⁷⁰ This doctrine aligns with the principle of parties' autonomy, a central component of international arbitration.

This more restrictive approach is, in fact, stated in Article 16 (1) of the UNCITRAL Model Law, which postulates that *"the arbitral tribunal may rule on its own jurisdiction, including any objections with respect to the existence or validity of the arbitration agreement. For that*

¹⁶⁷ Chawla, "Doctrine of Separability"

¹⁶⁸ Rogers and Benedettelli, "Validity and Interpretation"

¹⁶⁹ Born, "International Arbitration", 120.

¹⁷⁰ Chawla, "Doctrine of Separability"

purpose, an arbitration clause which forms part of a contract shall be treated as an agreement independent of the other terms of the contract. A decision by the arbitral tribunal that the contract is null and void shall not entail ipso jure the invalidity of the arbitration clause."

The arbitration agreement is independent of the underlying contract. However, this independence is limited to the arbitral tribunal's jurisdiction to consider challenges to its own jurisdiction. The usage of the words "for that purpose" at the beginning of the second sentence of Article 16 makes the purpose and intent of the separability doctrine clear.¹⁷¹

There is no legally binding contract if it misses one of its essential features, like acceptance. This may be an issue when a computer agrees with the smart contract terms, the clause is in code or does not create legally binding contractual obligations under the applicable law.¹⁷² Incapacity, in this context, is a person or entity's ability to legally or physically participate in an arbitration, for example, a minor or a non-existent company.¹⁷³ However, a properly coded smart contract, that is not legally a contract will nevertheless perform.

Because the separation between the contract and the arbitration clause is only so the arbitral tribunal can decide on its jurisdiction, if the arbitration clause is well written following what we covered in chapter 2.2, the tribunal can address the performance of the contract.

Although it is rare to find arbitration agreements signed by minors, the situation is different for legal entities such as commercial companies, which may face capacity issues under the laws of the jurisdiction where the agreement is enforced. Although the legal capacity of an entity should not be confused with how its representatives' actions bind the entity, Article V of the Convention has been interpreted broadly to include various types of incapacity, such as the lack of representative powers, the inability to sue or be sued, and the invalidity of power of attorney.¹⁷⁴

¹⁷¹ Chawla, "Doctrine of Separability"

¹⁷² Rogers, Jones-Fenleigh and Sanitt, "Disputes", 21–24.

¹⁷³ For this matter, it can be a blockchain structure like a DAO, for which there are several different interpretations of what type of legal framework it should have or if a DAO needs a legal framework at all.

¹⁷⁴ Casanova, "Convenção de Nova Iorque".

3.2.2: Enforcement would be contrary to public policy

Article V (2) (b) provides that a court may refuse enforcement of a foreign arbitral award if the award is contrary to the country's public policy where enforcement is intended. "Public policy" is determined on a country-by-country basis instead of being defined in the NY Convention. Despite the potential for lack of clarity and inconsistencies in global standards due to the absence of a clear definition, the 2015 IBA report on the Recognition and Enforcement of Arbitral Awards determined that the majority of countries surveyed considered "public policy" as a basis for refusing recognition or enforcement of foreign awards under the Convention to encompass only a limited set of essential rules or values, such as justice, fairness, or morality. So, in practice, the refusal of recognition and enforcement of a foreign award is rarely refused based on public policy objections due to its inherent difficulty to apprehend and precise.¹⁷⁵ Having this said, even with grounds of a potential violation of public policy, an award debtor will have a hard time persuading a court to refuse enforcement of a foreign arbitral award with an approach so prone to enforcement.

Now, additional criteria might be the underlying source of conflict – if smart contracts are, in fact, legally binding contracts. Even without specific legislation about the topic, the application by analogy of traditional contract law can provide a temporary solution. In the specific case of crypto assets, there are also potential barriers to enforcing awards in jurisdictions with tight regulations on their use and transfer. For example, the Chinese courts recently set aside an arbitral award (issued by China) that ordered the respondent to pay damages for failing to transfer a certain sum of Bitcoin.¹⁷⁶

Problems will also arise regarding the arbitration clause. Due to the "in writing" requirement of the NY Convention, enforcing an arbitration award issued after conducting an off-chain arbitration under an arbitration clause contained in a smart contract would certainly not be an easy task for a state court. First is the concept of "written form" – whether coding constitutes a language. We addressed this debate early on in this dissertation, concluding that a translation to natural human language would facilitate the process.

¹⁷⁵ IBA Subcommittee, *Public Policy Exception*, 18.

¹⁷⁶ Clifford Chance, "Arbitration", 4.

From the jurisdiction point of view, there is no advantage in refusing to enforce an arbitration award concerning smart contracts: as a complex set of rules, norms, rights, obligations, and prohibitions, it is in the system's best interest to evolve with its surroundings, providing closure for new upcoming types of conflicts. Nevertheless, the rising use of automation of the appointment of arbitrators or the introduction of elements of game theory into the decision-making process raises doubts about whether the state courts will enforce arbitration awards issued using blockchain technology.¹⁷⁷

The harmonisation arbitration enforceability of blockchain-related arbitration does not have to be difficult. Ad-hoc arbitration will play a significant role in the credibility of these conflicts. When choosing arbitration as a dispute resolution method and an arbitration seat, the award's reputation is more impacted by the reputation of its arbitrators than the reputation of the institution the parties chose. One thing that is probably even more important is how the arbitration proceedings are organised in the country chosen as the legal seat: in Switzerland, there is an active policy of capturing international arbitration with a fast-track annulment proceeding decided by the Superior Court of Switzerland within six months, with just one instance and a meagre rate of annulments.¹⁷⁸ If we think about an annulment that takes too long, this should concern the council's reputation far more than the institution.

Contracts using blockchain technology or automated parts encoded in smart contracts are also a way for companies with headquarters in countries with less developed judicial and financial systems, such as developing countries, to offer proof of trustworthiness and have an opportunity in the global market. In addition, this technology provides security and reliability regarding performance-inducing arbitration instead of judicial courts. It also provides more certainty and qualified arbitrators who can provide fair decisions.

There is a legal framework that considers smart contracts "legal relationships", and these awards are suitable for international arbitration due to the core features of DLT technology. The European Commission, in the Data Act draft, incentivise the use of dispute settlement bodies to achieve fair, reasonable and non-discriminatory terms.¹⁷⁹ In light of these

¹⁷⁷ Szczudlik, "On-chain" and "off-chain".

¹⁷⁸ This system was later on adopted by Austria.

¹⁷⁹ European Commission, Data Act draft, 28.

complexities, there would be much benefit in an ODR solution compatible with traditional legal principles and digital legal infrastructures, facilitating the adequate performance of SLCs, access to justice, and the satisfaction of procedural and any other jurisdictionally based regulatory requirements.

In addition, the Recommendation encourages States to adopt the revised article 7 of the UNCITRAL Model Law that establishes a more favourable regime for recognising and enforcing arbitral awards than that provided under the NY Convention. Finally, the recommendation states that "any interested party" should be permitted to exercise any rights it may have under the law or treaties of the jurisdiction where an arbitration agreement is being invoked to seek recognition of the agreement's validity.¹⁸⁰

¹⁸⁰ UNCITRAL, "Recommendation"

4. The Future of Tech-related Dispute Resolution

4.1 Technology and Fairness in Procedural Standards

There are several ways to ensure fairness and procedural standards in international arbitration. It requires adherence to international arbitration rules, appointing impartial arbitrators, equal treatment of parties, due process, transparency, and compliance with applicable law. These measures help to ensure that the process is fair, impartial, and transparent and that the decision reached is based on a complete and accurate record. In addition, international arbitration proceedings must comply with applicable law, including national and international laws and regulations. This solution helps to ensure that the arbitration is conducted under legal standards and that the decision is enforceable.

These methods are called "off-chain" arbitration, meaning arbitration procedures adapted to the technology sector while still using traditional legal models of decision-making, data processing and document production. "On-chain" arbitration uses different methods of achieving a final decision on the conflict, such as crowdsourced decisions¹⁸¹ built similarly to traditional international arbitration (following the principles of UNCITRAL Rules and the NY Convention).

Partly motivated by the Covid-19 pandemic, arbitration centres tried adapting their procedures to a more digitalized era. As a result, online dispute resolution has been created as a hybrid system that combines alternative dispute resolution techniques with information technology. This system is directly related to online markets and has become increasingly important in the global economy due to the growing significance of information technology.¹⁸² UNCITRAL recognizes ODR as essential for cross-border e-commerce disputes. The problem is the enforcement of different standards.¹⁸³

For disputes related to SLC, some benchmarks are critical to ensure fairness throughout the process: the selection of arbitrators, the equal treatment of the parties and transparency.

¹⁸¹ Crowdsourced dispute resolution is an online form of extrajudicial tribunal that uses untrained jurors demonstrating jointly the wisdom of the crowd. It is a solution for groups seeking to manage themselves by creating rules and establishing authorities and institutions to facilitate social regulation. For an in-depth study: Aleksei Gudkov, "Crowd Arbitration: Blockchain Dispute Resolution". https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3755762

¹⁸² Amro, "Machine Arbitrator"

¹⁸³ UNCITRAL, "Report of the Colloquium", 6.

Arbitrators and other participants in arbitration should not only be impartial and without conflicts of interest or personal connections to the parties involved. They should also possess technological skills, including knowledge of cybersecurity, data privacy issues, and blockchain technology. This expectation stems from continuing digitalization of the legal industry and international arbitration, with the evolution of existing professional and ethical obligations, including well-established obligations to maintain the confidentiality of proceedings and the arbitrator's duty of 'competence'. With this background in mind, major arbitral institutions and professional bodies have revised their arbitration rules or other guidance to expressly require or encourage consideration of cybersecurity and data privacy issues at the initial case management conference or other early stages of the proceedings.¹⁸⁴ Tribunals must be able to address cybersecurity and data privacy risks related to IT. As a result, institutional rules and guidance documents indicate that arbitrators and counsel are expected to have some level of technical knowledge to make informed decisions and provide proper procedural guidance. In other words, basic technological competence is required for arbitration.¹⁸⁵

In on-chain context, problems arise with the method of selection of the arbitrators as well as ways of making their decisions. Arbitrators are selected randomly but from a specific group of specialists in the blockchain area, which is not very big now. Therefore, there is a risk that the arbitrators will not be independent of the parties.¹⁸⁶

Second is the equal treatment of parties when providing equal access to information and evidence and equal opportunity to participate in the arbitration proceedings. This brings the question of transparency. International arbitration proceedings must be transparent, with the parties accessing relevant information and evidence. Arbitral participants must also comply with data protection and privacy laws and regulations that may apply to collecting, retaining, and processing data in the arbitration. These include the European Union's GDPR and similar laws and regulations in other jurisdictions. The ICCA-IBA Roadmap to Data Protection in International Arbitration gives nine principles that are common to modern data protection

¹⁸⁴ IBA Cybersecurity Guidelines address "security concepts" and suggests that, although help from IT professionals is essential in order to properly implement such concepts, it is critical that the lawyers involved themselves know which up-to-date measures should be put in place to protect their firm, which related questions are to be asked and when.

¹⁸⁵ ICC Commission Report, "Leveraging Technology", 7-8.

¹⁸⁶ Kasatkina, "Dispute Resolution Mechanism", 12-14.

laws: 1) fair and lawful processing; 2) proportionality; 3) data minimization; 4) purpose limitation; 5) data subject rights; 6) accuracy; 7) data security; 8) transparency; 9) accountability.¹⁸⁷ This helps to ensure that the process is fair and the decision is based on a complete and accurate record.

In a case where the main focus is smart legal contracts, the access relates to the blockchain or the smart legal contract code. This approach has a straightforward solution in case the blockchain is private – the party who owns that blockchain provides access to the other party and the arbitral tribunal. So, for example, a bank using a private, password-protected blockchain network will be accessible only to those the bank has approved. As a result, bank data is accessible only within the local network.

In the case of an SLC in a public blockchain such as Ethereum, the access to the content of the blockchain is made by Proof of Stake, and it is not proportionate to demand that from the arbitrators or the other party in the dispute in case the party is not part of the blockchain. The solution could be the party providing its access to the other party and the arbitrators, making the blockchain available at its expense to everyone who will need to use it, or, if possible, exporting the blockchain protocol to a document in reading format.¹⁸⁸ If a party objects to providing their access, it is necessary to understand why the party objects. Is it because it will materially increase costs beyond those the objecting party reasonably wishes to bear? Are there relevant cybersecurity or data protection concerns? Is there a legitimate concern about fairness or unequal treatment of the parties because of the proposed IT? Or is the objection asserted for another reason?¹⁸⁹

But on the other hand, the information security vulnerabilities of the on-chain blockchain platform may be exploited to obtain unauthorized access to information related to the dispute and the disputants. Of course, it does not mean information leaks do not happen in traditional arbitration. However, adding an extra layer of complexity to the arbitration process using unnecessary technology will create more problems than solve them—for example, the need for insurance policies to cover cybersecurity breaks. Therefore, the platform provider must use information security practices.

¹⁸⁷ ICC Commission Report, “Leveraging Technology”, 15.

¹⁸⁸ For this reason, the use of tech experts will definitely increase in the next years.

¹⁸⁹ ICC Commission Report, “Leveraging Technology”, 10-11.

Because of the inherent limitations of off-chain arbitration, courts could only force the parties to execute a secondary transaction or otherwise pay remedies for a smart contract that created damages for one of the parties. Courts cannot change the terms of the given smart contract executed according to its parameters and added to the blockchain because they cannot change the existing code. Second, the cost of arbitration also withdraws consumer disputes from this solution. This is because the average costs of consumer disputes are disproportionate to those of institutional arbitration. Moreover, institutions' traditional arbitration procedures are not scalable: human-powered dispute resolution cannot address numerous online disputes, which can run into the millions.¹⁹⁰

4.1.1 Artificial Intelligence (AI) in the Decision-making Process

The advent of new technologies changed how disputes can be handled using artificial intelligence (AI). At the current stage of development of AI, it will mainly assist in document production. However, it will eventually evolve to a point where it could be involved in decision-making.

Predictive coding, a form of supervised machine learning AI, can be utilized in disputes to evaluate a party's case's strengths and identify relevant documents they may want to use. Additionally, predictive coding can help identify documents responsive to a document request or tribunal order. However, there are currently no rules or guidance on whether a party intending to use predictive coding in the context of a search for responsive documents must disclose that fact to other parties or the tribunal. Nor is there any guidance on whether predictive coding must be agreed upon by other parties or approved by the tribunal. During the case management conference, parties and tribunals should consider discussing predictive coding as part of a protocol where parties agree on search terms, date ranges, or predictive coding parameters, possibly with the tribunal's involvement. Predictive coding is becoming more common and may be at least as accurate as human review, as some legal authorities in certain jurisdictions have upheld its use based on data.

¹⁹⁰ There is no surprise that online platform such as Alibaba in China or E-bay in US have their online consumer dispute resolution procedures, due to the enormous scale of their business.

Automatically generated translations of documents are now commonly provided by machine learning AI. However, this technology may pose confidentiality and security risks and possible breaches of data privacy obligations, especially if the content is stored for developers to improve the AI's vocabulary base. Furthermore, despite the lower cost of AI-generated translations compared to human-generated translations, they may also be less accurate due to their current development state.¹⁹¹

AI can be crucial in managing legal matters concerning efficient contract review, fraud detection or big data. However, its application in helping an arbitral tribunal reach a final decision is very much in the realm of possibility.

AI can help judges and lawyers in predictive sentencing, meaning to predict the outcome of a case based on past precedents, which can aid in making fair and impartial decisions. In addition, AI can help lawyers and legal researchers by quickly identifying relevant laws, regulations, and cases that may be relevant to a case. Finally, it can assist in resolving disputes by mediating between parties and helping to reach a mutually agreeable outcome.

Some national laws only accept a human as an arbitrator, including the UK, Portugal, Spain, and the Netherlands. However, the UNCITRAL Arbitration Rules, under section IV, do not directly prohibit using AI to reach an arbitral award. And according to Article 19(1), the parties have the right to choose which procedure the arbitral tribunal will follow when conducting the proceedings. For some authors, this allows for using AI as a tool during arbitral procedures and the decision-making process.¹⁹²

However, even though AI can optimize the efficiency of the dispute resolution process, some concerns about automated decision-making were raised during the UNCITRAL Colloquium for Digital Dispute Resolution. While it was said that such a process could help handle simple and repetitive disputes, it was suggested that ethical standards should be prepared for using AI, particularly in decision-making, to ensure accountability.¹⁹³

¹⁹¹ ICC Commission Report, “Leveraging Technology”, 29-30.

¹⁹² Chauhan, “Future of AI in arbitration”

¹⁹³ UNCITRAL, “Report of the Colloquium”, 5.

To our understanding, at the current stage of development of this technology, there is no AI capable of deciding under the rules for substantive, legal, ethical, and procedural reasons. This is a heavily complex system of decisions and variables, and even the most advanced AI today is, in a way, just intelligence mimicry.¹⁹⁴ The concerns its usage raises are similar to the ones on-chain blockchain raises as well.

First, the jurisdictions that only accept humans as arbitrators will evoke public policy as the reason not to enforce the automated award, considering that some national laws require that an arbitral award be made by a human arbitrator, as noted above. Human intervention is a primal part of the decision process for justice and fair due process for these jurisdictions. Apart from efficiency, one of the main reasons to use AI is its supposed neutrality. However, there is no way to secure unbiased decisions with AI because its opinion on a subject matter will depend on what information the AI was fed, which depends on the company that develops such AI. There is no regulation on the ethical development of AI so far.

Second, the error margin is questionable – the lack of appropriate nuance, a code bug, an incorrect perception of analyzed data – which can add costs to the arbitration process through revision of the decisions and subsequent lack of trust in the success of these technologies.

And third, the use of machine arbitrators will face cybersecurity problems, like hackers.¹⁹⁵

Nonetheless, the cooperation between AI and arbitration benefits all participants involved. It provides both parties and arbitrators with additional tools that help to make dispute resolution more effective. We believe the most effective solution for the time being, both from a technical side and a legal side, would be using AI as an ancillary tool for human decision-making.

With the development of this technology, it will be able to actively participate in the decision process as an ancillary arbitrator somewhere in the future. If practitioners and institutions consider AI suitable for arbitrator appointments, it could enlarge and diversify the pool of

¹⁹⁴ However, the 2022 Expert Survey on Progress in AI conducted with 738 experts who published at the 2021 NIPS and ICML conferences, AI experts estimate that there's a 50% chance that high-level machine intelligence close to technological singularity will occur until 2059. <https://aiimpacts.org/2022-expert-survey-on-progress-in-ai/>

¹⁹⁵ Amro, "Machine Arbitrator". Veronika Pavlovskaya raised this issue first during her presentation on the 10th ICC YAF-YAAP Joint Conference, titled: "Young Approaches to Arbitration". Vienna, March 24, 2018, unpublished.

arbitrators and ultimately provide a more solid solution from an ethical standpoint. This could be very useful in order to avoid groupthink¹⁹⁶. AI could be programmed to function as a devil's arbitrator. This cognitive diversity could reduce the risk of biased decision-making and improve the quality of awards.¹⁹⁷

But for the time being and in the foreseeing future, the parties and their legal counsel could employ increased automation in arbitration in preparing submissions and evidence and by the arbitral tribunal in conducting the proceedings and rendering the award. These advancements were made before with the general use of computers, e-mail or digitization of documents, which greatly enhanced the efficiency of the proceedings.¹⁹⁸

4.2 On-chain arbitration and automated awards

In the spectrum of technology's possible use in alternative dispute resolution, projects involving blockchain arbitration are addressed as "on-chain" arbitration. This groundbreaking innovation involves solutions in which a smart contract automatically executes an award without the involvement of any third parties and any additional action by the parties. For example, this might occur by the parties making available to the smart contract certain assets (e.g. cryptocurrencies) which, upon the occurrence of a defined condition (issuance of an "award"), are transferred from one party to the other.¹⁹⁹

An example of an on-chain arbitration platform is the Juris Project. So the platform can be used, the smart contract in question must have an integrated coded arbitration clause based on the Juris Protocol Mediation and Arbitration. In case of a dispute, the complaint user initiates the protocol. The system suspends further execution of the smart contract and notifies the other party. After that, three procedures are possible: self-mediation, a voting poll mechanism called SNAP (Simple Neutral Arbitrator Poll) or Juris PANEL (Peremptory Agreement for Neutral Expert Litigation). The latter is the analogue of traditional arbitration proceedings based on the UNCITRAL Arbitration Rules. The dispute is reviewed by three

¹⁹⁶ Groupthink is a psychological phenomenon that occurs when a group of individuals reaches non-optimal decisions without critical reasoning or evaluation of the consequences or alternatives motivated by the urge of reaching consensus. Premature consensus may be fueled by a particular agenda or due to group members valuing harmony and coherence above critical thought. This desire creates a dynamic within a group whereby creativity and individuality tend to be stifled in order to avoid conflict.

¹⁹⁷ Allen, Córdova and Hall, "Cognitive Diversity", 619-622.

¹⁹⁸ UNCITRAL Working Group II "Draft Provisions", 10.

¹⁹⁹ Szczudlik, "On-chain" and "off-chain".

arbitrators selected based on their reputation and compliance with the requirements specified by the parties while entering the contract.²⁰⁰ If legal follow-up is needed, this solution will provide a binding judgement, enforceable by UN treaties in most countries. If the case is escalated, the Juris system will select a panel of three High Jurists using the UN-mandated rules and convene virtually through the Jurist Platform. They will have a pre-determined amount of time to hear additional arguments from the parties, request, collect, and review additional evidence or any other procedure they consider relevant for the case. Once this panel has decided, the presiding High Jurist will have the power via the CDK to execute the decision by immediately running the modified contract instructions. The dispute is marked resolved, and the additional JRS allocated for escalation is paid out evenly to the High Jurists who made up the panel.²⁰¹

However, using this conflict-solving platform is only possible if the smart contract in question, including the Juris arbitration protocol, was coded in the first place.

"Automaticity", as the ability to enforce a decision automatically without the need for the losing party's consent, is appealing. These solutions could diminish the cost and lengthy delays associated with enforcement proceedings that are often required following receipt of an award.²⁰² However, this change in the role of a decision-maker marks a shift from traditional practices and presents further legal and practical obstacles. The use of technology to select and appoint arbitrators was also illustrated as benefiting the parties in the most time-consuming stage of the arbitration. However, it was stated that such a technology required collecting data from a wide range of sources, which posed certain challenges.²⁰³

It is, however, an intriguing solution: if the award is executed automatically, it cannot be examined in advance whether it meets the requirements for enforcement by the state court.²⁰⁴

First, on-chain arbitral awards may not be recognized and enforced under Article II of the NY Convention because it applies only to agreements "in writing".²⁰⁵ As mentioned before

²⁰⁰ Kasatkina, "Dispute Resolution Mechanism", 150.

²⁰¹ Kerpelman, "overview"

²⁰² Morgan, Livingston, and Moir, "Dispute Resolution", 451.

²⁰³ UNCITRAL Working Group II "Draft Provisions", 10.

²⁰⁴ Szczudlik, "On-chain" and "off-chain".

²⁰⁵ Kasatkina, "Dispute Resolution Mechanism", 12-14.

concerning the "in writing" requirement for the arbitration clause, we believe the same arguments apply to an on-chain arbitration decision: It needs to reach a decision translatable to the natural language, so the court understands what is being enforced.

Second, crowdsourced blockchain-based platforms achieve final solutions through poles and voting. The guarantees of impartiality and *contradictoire*²⁰⁶ may be considered compromised by some jurisdictions due to the method of selection of arbitrators and how they reach their decisions, as well as the incorporation of game theory into the decision-making process. It is uncertain whether the automatic and random selection of a judge or group of judges ensures their independence, capability and impartiality within the meaning accepted in commercial arbitration. The risk that arbitrators selected in this manner will not be independent of the parties is relatively high.²⁰⁷ Groupthink, as mentioned before, is also problematic. The existence of arbitrators will always be needed. Deciding on a case solely based on documentary evidence will be extremely difficult to achieve, if not impossible. Resolution of disputes, particularly in complicated matters, will require other forms of evidence, such as the testimony of witnesses or experts.

The cases where mandatory representation is not attended will automatically violate principles of fairness and the function of the judiciary powers.

The last concern to be raised is the unclear compliance of the platforms with data protection regulations. The increased complexity of data processed during arbitration and the rise of applicable data protection laws have amplified interest in the topic. It became a vital issue in international arbitration after hacking the website of the Permanent Court of Arbitration in The Hague in 2015.

GDPR has become the applicable legal framework in most arbitration proceedings, regardless of the seat, thanks to its extraterritorial scope.²⁰⁸ The material scope of the GDPR includes "*the processing of personal data wholly or partly by automated means and to the processing other than by automated means of personal data which form part of a filing*

²⁰⁶ People who do not trust each other may act tentatively and keep important information to themselves. As a result, disputants participating in ODR processes may not disclose all the relevant information to online arbitrators.

²⁰⁷ Szczudlik, "On-chain" and "off-chain".

²⁰⁸ Landi, "Remote Hearings: Observations", 127.

*system or are intended to form part of a filing system".*²⁰⁹ Indeed, arbitration proceedings at all stages typically involve the processing of a massive amount of data, including "personal data" as defined by Art. 4(1) GDPR.

The parties cannot choose legislation as the applicable law to the arbitration proceedings while simultaneously requiring the arbitral tribunal to ignore their data protection and privacy rules. The core principles of the GDPR are the right to privacy and family life and the right to the protection of dignity and personal identity, backed up by the European Convention of Human Rights (ECHR) and the jurisprudence of the Strasbourg Court. These principles are at the core of developing a legislative system that wants to develop a robust data economy without compromising citizens' freedoms and democracy. We believe non-compliance with these rules would likely undermine the possibility of enforcing the arbitration award in the EU and other countries with similar views on processing personal data due to a violation of public policy. Therefore, GDPR should always be considered a mandatory rule for international arbitration.²¹⁰

The access to personal data by different actors (network owners, technology developers, nodes participating in the network or the data subjects themselves) and their equal status in the network complicates determining the status of data controller and data processor among them, as required by the GDPR. Likewise, exercising the rights of erasure and rectification is not guaranteed, as smart contracts operate in an immutable network. Immutability, in turn, makes it impossible to modify the agreement in the event of new circumstances arising in the contractual relationship or the need to adapt it to regulatory changes. Nor are they infallible tools. Although smart contracts are formulated precisely, they are not immune to programming errors (bugs) or possible hacks.²¹¹

On another note, for the Singapore International Arbitration Centre, which has dedicated more resources to this topic, there are ways for the outcome of arbitration to be theoretically binding if the output of the dispute can be fed back into the smart contract using an

²⁰⁹ With few exceptions, see Art. 2 GDPR.

²¹⁰ Landi, "Remote Hearings: Observations", 135-137.

²¹¹ Rodríguez, "Ley Aplicable", 443.

"oracle."²¹² So this can happen, and the arbitration decision must be translated into code to be executed automatically. This possibility would have lower disorder costs (given the reduction in the capacity of individuals to hold up or disregard the outcome of dispute resolution) but higher levels of "dictatorship costs" (due to the more centralized powers of the arbitrator).²¹³

With smart legal contracts, combining contractual mechanisms and a natural language clause prescribing the relevant obligation is possible. The clauses that can be expressed or automated via incorporated codes should be carefully selected and classified based on principles of good legal drafting. The wording chosen for the traditional contract must highlight that the relevant code acts as a translation of the natural language clause, using, for example, the form of an interpretation provision.

Using code in an SLC to automate notifications and specific steps of the dispute resolution mechanism will require careful, specialist drafting to ensure effective dispute resolution is available to users.²¹⁴

The efficiency of off-chain arbitration should not sacrifice fundamental principles of fairness and justice. It might even create a paradox: A decentralized court decision will become more and more resource-intensive over time as the parties will try to determine all possible circumstances in the program code. The parties will have to discuss each dispute from the beginning, without knowing the previous cases, achieving a point where efficiency is lost.

²¹² Smart contracts cannot call their own functions when conditions are met, as all functions must be called by either a crypto wallet or by another smart contract, making automated event triggers difficult to implement. An oracle, in the context of blockchains and smart contracts, is an agent that finds and verifies real-world occurrences in a decentralized and unbiased way and submits this information to a blockchain to be used by smart contracts. The most common functions are cryptocurrency price feeds, random number generation, and smart contract automation.

²¹³ Allen, Lane and Poblet, "Dispute Resolution", 87.

²¹⁴ Blycha, Horrigan and García-Perrote, "Impact", 6-7.

Conclusion

We started with the research question, “How can International Arbitration be the solution for Smart Legal Contracts disputes?” to answer it simply, we would say: “by adapting”.

Adapting to the upcoming issues of the technology development sector is the natural evolution of conflict resolution: a more complex society with more complex issues and relationships will inadvertently have more complex conflicts to solve.

Even for experts who are not crypto asset enthusiasts, the potential use of blockchain technology and smart contracts in the banking and insurance sector is undeniable. Smart contracts are self-executing when conditions are met, secure, efficient, transparent, tamper-proof, and permanent. These features reduce the cost and increase the efficiency of transactions. Moreover, they can be customised to suit the specific needs of the parties involved without the need for human intervention. All these features are desirable for business interactions in a fast-pacing world.

Blockchain, as the base for smart contracts, is already influencing dispute resolution mechanisms:

As a new object of litigation, the rise in popularity of blockchain technology translates into increasing litigation regarding its application and use in many markets and industries.

As the trigger to creating specialised *fora*, blockchain is a concern for courts in many countries, some of which have already set up specialised courts like China, for the litigation that typically arises between companies operating with blockchain that must submit blockchain records to prove their case.

As a new litigation platform, blockchain is becoming the object of legal proceedings as a mechanism for dispute resolution. International dispute resolution is also slowly opening up to blockchain, with critics voicing their discomfort and the apparent stages of the digital remodelling of dispute resolution mechanisms.

As a way of safeguarding information, blockchain technology helps simplify the authorities’ custody and handling of evidence.

Most of the time, smart contracts will either be utterly self-enforcing because they are written in code or traditional contracts that are partially automated by putting some of the parties' actions (like payments or insurance premiums) into the blockchain. In either case, they will have legal significance. These are smart *legal* contracts. They satisfy the legal requirements of a contract: including offer and acceptance (and consideration, in case of common law jurisdictions).

However, the same intrinsic characteristics that make this tool unique will probably be the ones that will make it more prone to conflict. These topics are inherently transnational, and to allow this technology to flourish, a reliable and resourceful arbitration framework is key. Additionally, international arbitration provides a neutral forum for parties from different countries to resolve their disputes, making it an ideal solution for disputes involving parties from different jurisdictions. In conclusion, international arbitration can be seen as the solution for smart legal contracts disputes as it offers a fair and efficient means of resolving disputes in the digital age.

The impact of SLCs on dispute resolution is multiple. First, the inclusion of code and the automation of certain aspects of the contract add a layer of complexity to the operational issues in Smart Legal Contracts. As an illustration, the operation of the SLC contract may be impacted by coding bugs, wrong 'oracles' or hacking, and failure to execute the contract properly. Relevantly, the consequence of the mistake or error will be felt in real-time - rather than being litigated post-facto, the incorrect code/data has already had consequences that must be made good. Thus, when code is incorporated into a contract, the parties should specify in advance whether the failure of code to run as expected gives rise to a breach of contract, or whether alternative manual means of performing the job the code was meant to perform will still suffice as performance.

We can also anticipate two significant sources of conflict related to blockchain characteristics: the modification of an SLC and the capacity of the parties. The modification *ex post* of an SLC is not possible due to the immutability of the blockchain. One solution could be, *ex ante*, the parties chose to write the SLC so that it would be programmed to be periodically reviewed. This is also one of the solutions proposed by on-chain arbitration platforms.

In the case of the capacity of the parties, the issues could be the anonymity provided by the blockchain or related to their capacity to accept a contract and, ultimately, to consent to an arbitration agreement. This raises more concerns in cases of retail e-commerce or in cases where one of the parties is a non-recognised type of company. Even though the connecting factor is their place of residence or personal law, it is still in the scope of the arbitration clause. To facilitate the process, even though this may vary from tribunal to tribunal, the arbitral tribunal should give itself the competence to solve the issue, following the *kompetenz-kompetenz* doctrine.

Despite the current SLC arbitration procedures still playing a disadvantage, contracts using blockchain technology or automated parties encoded in smart contracts are also a way for companies with headquarters in countries with less developed judicial and financial systems to offer proof of trustworthiness and have an opportunity in the global market. On the one hand, this technology provides security and reliability when it comes to performance; on the other hand, using arbitration instead of judicial courts also provides more certainty and a guarantee of the necessary qualification concerning the arbitrators intending to reach a fair decision.

Traditional law or contracts do not have only executive functions. They are social mechanisms designed to preserve public order, national security, and the interests of the private sphere, characterised by the need to support economic growth and promote individual autonomy and fundamental rights. Computer codes can represent terms that are expressions of logic, but unlike law, they are not aimed at organising society or based on concepts such as reason or conscience.

A well-written arbitration clause is the best defence: by choosing the most suitable governing law for these contracts, the parties ensure the governing law recognises the legality of a smart legal contract. This improves speed and efficiency and reduces costs.

This agreement could be in the form of a traditional contract or incorporated into the code of the original smart legal contract. In a case of a fully automated smart legal contract and assuming the automated tasks are straightforward commands which do not need nuance to be completed correctly, its language could be just the code. Coding is a language

nonetheless, even if it is a human-created language for computer interactions and is subjected to legal interpretation. However, for the sake of bigger interchangeability between the programming language and a human language, we would recommend the translation of the code into the language the parties agreed to be the governing language of the contract. This will also facilitate its interpretation.

The interpretation of an arbitration clause in a smart legal contract is generally governed by the law of the jurisdiction specified in the clause or, in the absence of a specified jurisdiction, by the law of the jurisdiction in which the contract was formed. The interpretation of an arbitration clause will depend on the specific terms of the clause and the facts of the dispute.

In some cases, an arbitration clause in a smart legal contract may be challenged because it is unclear or invalid for some other reason.

That said, not everything about the international arbitration legal framework needs to be changed. Only a few cases will have specificities: interim measures and the treatment of blockchain digital evidence. The procedure for interim measures has not been addressed separately in the ad hoc arbitration rules for the digital age. However, blockchain-related conflicts can radically improve with legal tech platforms if the courts are willing to consider these tools practical and reliable. In the case of digital evidence, there is still some scepticism from the courts about what rules should be implemented. However, the ad hoc arbitrations leaned on creating exciting solutions, even creating guidelines for arbitrators and the institutions that became targets of cybersecurity breaches.

The recognition of these arbitration awards will largely depend on how tech-savvy and progressive the courts are. However, from the point of view of the NY Convention, it is possible to guarantee all the required compliance.

Finally, these technologies cannot undermine the parties' right to a fair trial. The future of dispute resolution will pass through AI in the decision-making process and on-chain arbitration. Arbitration awards obtained using these tools can still respect the rules portrayed in the NY Convention and could even be helpful for national courts, not only arbitration.

The ICC has addressed the need for standards, rules and guidelines to discuss these issues during the UNCITRAL Colloquiums for Dispute Settlement. We can follow International

Arbitration Rules like the UNCITRAL or ICC Arbitration Rules to ensure technology does not unfairly impact arbitration. We also need to ensure that arbitrators are impartial and that the proceedings are fair. Additionally, we need to treat all parties equally by giving them the same access to information and evidence and equal opportunities to participate in the arbitration process. The right to due process includes the right to be heard, the right to a fair and impartial hearing, and the right to an impartial and independent decision. Transparency helps ensure that the process is fair and that the decision is based on a complete and accurate record. And lastly, compliance with applicable law, including national and international laws and regulations.

It is important to note that while AI can aid in solving legal problems, it is not a substitute for human judgment and decision-making. AI can provide support and information to aid in legal decision-making, but the ultimate responsibility for making legal decisions rests with human beings.

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