Edited by
Milena Ratajczak-Mrozek · Paweł Marszałek

Digitalization and Firm Performance

Examining the Strategic Impact

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The Digitalization of Contracts in International Trade and Finance: Comparative Law Perspectives on Smart Contracts

Cristina Poncibò

Introduction

The term "digital economy" has been extensively used to describe the functioning of the economy and, in particular, that part of the economy which is linked to information and communication technologies (ICT). The digital economy is characterised by three main factors, including network effects, change of business cycles and new business methods (OECD, 2000). Briefly, "digitalisation" represents a new way of doing business that uses information and technology as facilitators of communication, data transfer and commercial transactions. In particular, the chapter examines the case of digitalisation of commercial transactions by considering, specifically, the case of smart contracts. Notwithstanding the vast amount of literature on blockchains (Seebacher & Schüritz, 2017), the legal framework remains uncertain, particularly, in relation to the

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legal meaning of smart contracts (Di Matteo et al., 2019; Hacker et al., 2019). Thus, the chapter contains a legal analysis of this phenomenon. It analyses the legal framework for smart contracts by considering European private international law and employing a comparative law approach. It also questions the role of technology and industry self-regulation to develop smart contract models and standardise them. For example, the latter approach is central in the case of smart Incoterms® rules and smart derivative contracts. To deal with these issues, section "Smart Contracts: Main Characteristics and Applications" introduces the main economic applications of smart contracts and their relationship with blockchain technology. Section "Smart Contracts: EU Private International Law" deals with smart contracts according to European private international law. Section "Smart Contracts: Comparative Perspectives" contains a comparative analysis of common law and civil law approaches to the legal meaning of smart contracts. Section "Self-Regulation and Technology" examines the role of programmers and industries in self-regulating and standardising smart contracts. Section "Conclusions" contains our preliminary conclusions.

Smart Contracts: Main Characteristics and Applications

Blockchain as a Basis for Smart Contracts

The expression "blockchain technology" is often used to refer to the wider concept of distributed ledger technology (DLT) (a decentralised ledger) in which there is no central authority that controls, verifies and validates these transactions, as it consists of a peer-to-peer system which shares these records with all nodes. These records are unchangeable and continuous and are merged into blocks that are chained to each other to produce the blockchain (Buterin, 2015; Finck, 2018; Wright & De Filippi, 2015). Specifically, it has been said that "Blockchain is a peer-to-peer, distributed ledger that is cryptographically-secure, append-only, immutable (extremely hard to change), and updateable only via consensus or agreement among peers" (Bashir, 2018).

Thus, when we talk about decentralisation in blockchain, we refer to a fundamental feature of blockchain: the platform works without the need for intermediators and it functions by consensus mechanism.[1] For instance, the economic relations within the blockchain are defined as decentralised and disintermediated. An author notes "When value is transferred through blockchain networks, the traditional intermediaries responsible for verifying and validating transactions – human-based institutions – may become obsolete" (Finck, 2018). Regarding decentralisation, it is difficult to identify the participants on the platform or their location, and that makes determining the applicable law and jurisdiction increasingly difficult when disputes arise.

With respect to our understanding of such technology, it is necessary to make a preliminary distinction between public and private blockchains. In public (permissionless) blockchains, there is no single authority or entity which controls or manages the chain of nodes and the transactions are open to the public, with the anonymity of the nodes preserved and without any privileges being given. Generally, this type of blockchain is criticised due to the absence of a reliable authority for validating or/and verifying the transactions, although it requires a consensus by the nodes. In contrast, in private (permissioned) blockchains, the permission to join is given by an authority and the nodes are well known to the entity. However, such a model assigns certain privileges to the authority and/or certain nodes in order to verifying the data, thus it is highly efficient. Usually, private blockchains might use their own standards and, consequently, this practice creates an endless number of standards for blockchain and smart contracts. The problem of interoperability specifically concerns the difficulties of connecting various private blockchains.

Blockchain technology is facing many obstacles that would adversely affect its adoption. Therefore, it is necessary to point out that one of the main challenges affecting blockchain adoption by businesses is the current absence of a clear legal framework. Historically, the law always finds a path to regulate the technology, hence, the law will find an

[1] Adopting the consensus pattern makes the decentralisation of blockchain possible without the necessity of a central authority or entity, it should be borne in mind that not having a unique liable authority creates legal concerns related to defining the jurisdiction.

appropriate model for regulating blockchains and smart contracts (EU Blockchain Observatory, 2019).

Smart Contracts: The Main Characteristics

According to Nick Szabo (1996), the computer scientist who coined the term, a "smart contract is a computerised transaction protocol that executes the terms of a contract". Thus, smart contracts are applicable in the blockchain arena and the latter qualifies the smart contract by building on its distributed ledger. To be more precise, it has been stressed that "A block is a software-generated container that bundles together the messages relating to a particular smart contract. Those messages may act as inputs or outputs of the smart contract programming logic and may themselves point to other computer code" (Chamber of Digital Commerce, 2016, p. 10). Another definition of a smart contract based upon a blockchain could be "a self-executing piece of code situated on the shared ledger and maintaining its own state and that is theoretically immutable" (de Caria, 2017; Poncibò, 2020b).

When discussing smart contracts, one should consider their different aspects and features. Firstly, smart contracts are programmes that can be executed automatically under certain conditions or requirements. This idea met with unprecedented popularity, as they have the feature of being unchangeable once they are stored on the blockchain(Perugini & Dal Checco, 2015). Thus, they rely on software language and are automatically executed without the human element (de Caria, 2017).

On such basis, the legal meaning of smart contracts is disputed in the legal scholarship, and the binding nature of smart contracts (i.e. smart legal contracts) can only be ascertained on a case-by-case analysis, by considering certain factors, such as parties' consent, consideration, and legality, according to the applicable law. Thus, it is necessary to clarify that this chapter considers only smart (legal) contracts that generally contain the essential elements of a valid and binding contract according to the common standards of domestic contract laws. In fact, it is true to say that "(…) under certain circumstances and if so decided by the parties, smart contracts can fulfil the elements of a legally binding

contract under common law and civil law systems, such as the United States and Spain" (US Chamber of Digital Commerce, 2018 at 15).

Secondly, it is also important to clarify that there are many different models: contracts entirely in code; contracts in code with a separate natural language version; natural language contracts with encoded performance; and/or natural language contracts with encoded payment mechanisms (Chamber of Digital Commerce, 2016, p. 9). In any event, here the point is that traditional contracts are drafted by lawyers using natural language, while smart contracts are written in programming language, hence, this will be an enormous challenge to contract law. In the future, lawyers will have to learn how to code contracts instead of drafting contracts, and this entails uncertainties and complexities regarding the interpretation of smart contracts before the courts (Wilkinson & Giuffre, 2021). Additionally, parties may face difficulties with a contract written in programming language, because this language in not as flexible as the natural language of a traditional contract, and it is not able to express many significant legal terms, e.g. good faith or force majeure (de Caria, 2017; Poncibò, 2020b).

Thirdly, smart contracts are self-executing once specific conditions and requirements have been verified. The self-executing is due to the simple mechanism of executing that characterises the course of smart contracts, which is based on identifying all the terms and conditions of the contract, following which the computer will implement the contract in a very precise and fair way. We can also add another positive effect of the self-executing feature: automation will lead to a reduction in the cost of commercial transactions. Unfortunately, self-executing deprives the parties of what is considered one of the most important features of traditional contracts, namely the possibility to amend or terminate the contract. In other words, in traditional contracts one party can ignore a partial breach of the contract by the other party if the commercial relation is highly valuable and parties have agreed upon a solution to that breach. In fact, in smart contracts this option is not available, due to the automatic execution with no ability to make amendments. Additionally, self-executing implies that undesired transactions cannot be undone. This problem manifests itself when there is a lack of legal capacity, particularly in regard to signatures, where in smart contracts there is only a

digital signature instead of manual signatures, and this could open the door to unlawful activities.

Fourthly, the legal system guarantees that the rights of a party will be realised, as well as providing duties or remedies following any kind of breach of contract. This is based on the element of predictability that contract law provides. The distinction between digital enforcing and self-enforcing is relevant in the case examined here: digital enforcing is generally based on a third party, whereas a smart contract is self-enforcing and—ideally—it does not require a third party to enforce it (i.e. judges, arbitrators). Self-enforcement allows parties to a smart contract to secure mutual obligations without relying on third parties (de Caria, 2017; Poncibò, 2020b). Nevertheless, this mechanism of enforcement is criticised in many aspects. Some claim that smart contracts are automated and performed by computers without any external intervention, and they cannot be stopped by parties, courts, or any third party; however, these are considered as weaknesses of self-enforcement. Smart contracts are not flexible and not able to adapt to new situations or circumstances, and current legal systems and contract law are not able to adopt such a mechanism of enforcement. In this respect, unpredictability is also one of the challenges that have arisen with smart contracts.

Smart Contracts: Some Economic Applications

Turning to the relevance of smart contracts for business, the US Chamber of Digital Commerce has explored twelve use cases of smart contracts, including digital identity, records, securities, trade finance, derivatives, financial data recording mortgages, land title recording, supply chain, insurance, and the health sector (Chamber of Digital Commerce, 2016, pp. 15–37). Ream et al. (2016) also offer a detailed picture of the range of applications of smart contracts for business.

In particular, scholars are contributing by analysing the most promising applications of blockchain for business by discussing its impact on the following: (a) financial services, (b) manufacturing and industrial processes, (c) consumer goods and retail, (d) the food industry;

and (e) cybersecurity and Internet of Things (IoTs) (Christidis & Devetsikiotis, 2016). In the light of the above, they have looked at applications of blockchain in different industries and highlighted the great impact of this innovation for business in improving efficiencies and reducing costs (Attaran & Gunasekaran, 2019). For example, it seems that blockchain may play a significant role in fostering emerging markets and economies including smart cities, value-based healthcare, the decentralised sharing economy, machine to machine transactions, and the data-sharing marketplace.

From a legal perspective, smart contracts may represent good vehicles for the implementation and automation of business processes, particularly as regards those processes that, by involving multiple parties (e.g. global supply chains), need to be governed efficiently, through automation and digital trust. Interestingly, the parties need to trust each other fully in a contract system; they may also trust the State and, specifically, the judicial system to enforce the contract. In contrast, smart contracts eliminate the need for trust and intermediaries; therefore, self-enforcement will replace the legal system, and the parties will then be able to shape agreements without relying on the State. The mechanism of digital trust enabled by the blockchain, coupled with the flexible design and easy implementation made possible by smart contracts, can support existing business processes and pave the way for business relationships on a global scale hitherto impracticable due to costs and complications inherent to traditional methods of trust management (Huang & Carlsson, 2016; Werbach, 2018). We are therefore witnessing a metamorphosis of the concept of trust of economic operators: from that of the Hobbesian type—characterised by State authority which guarantees the fairness and execution of the contractual relationship—to blockchain trust, in which the parties involved ignore the existence of any authority, replacing it with the use of a specific technological medium (Cole, 2019; Werbach, 2018). Each user can in fact use blockchain technology while remaining almost anonymous or even, at least potentially, completely anonymous (De Filippi & Wright, 2018).

Smart Contracts: EU Private International Law

Legal Uncertainty

Having considered the above, it should be noted that the smart contract is particularly suitable for managing cross-border transactions, due to its digital nature as an agreement and computer programme running on blockchains. By relying on digitalisation and automation, such an instrument promises to be very efficient: it will contribute to cost reduction and trade facilitation. On the other hand, when the smart contract contains (and codes) cross-border commercial transactions, namely in the vast majority of cases, it presents serious legal risks with respect to the identification of the appropriate law and jurisdiction in the event that any dispute arises among the parties (Omlor, 2020; UNCITRAL/UNIDROIT, 2019).

In this respect, it should be stressed that the European legal framework for cross-border smart contracts remains unclear, according to legal scholars and, thus, this chapter attempts to address this gap (Lehmann, 2019; Pretelli, 2018; Rühl, 2019, 2020). In particular, the solutions offered under EU private international law are residual, in the sense that it intervenes only when the smart contract has not been able to execute itself or to find an internal remedy (in the code), thus inducing the alleged injured party to take recourse before the courts.[2] It should be noted that the scarcity and lack of homogeneity in the regulatory solutions adopted, particularly at the European level, gives rise to further legal doubts (Pretelli, 2018). Similar coordination problems had actually already arisen following the advent of the Internet and, in general, of ICT and, now, DLTs. In particular, doubts about the applicable law and the choice of jurisdiction have long affected cross-border contracts concluded online that ought to have been governed by the laws of cyberspace and

[2] Article 1.2 of the regulation excludes arbitration from the matters of application of the Brussels I-bis Regulation but specifies in recital 12 that "This regulation should not apply to arbitration. Nothing in this Regulation should prevent the courts of a Member State having an action in a matter for which the parties have entered into an arbitration agreement, from referring the parties to arbitration or from suspending the proceedings or declaring inadmissible. request and to examine the possible nullity, inoperability or inapplicability of the arbitration agreement, in accordance with its national law".

not by the sources identified by private international law. Over time, the image of the Internet as the seventh continent—necessarily without borders and endowed with autonomous discipline—has, however, been overcome. It has been found that the Internet consists of servers or, in any case, indirectly, of centres of interests and actions, and, thus, of responsibility. Furthermore, DLTs also present some centres of interests in the physical world (Finck, 2018).

Choice of Jurisdiction

In this section we discuss the issue of identifying the jurisdiction, leaving the question of the applicable law to the next section. Having said this, Brussels I Regulation (recast) could only be applied in the presence of certain requirements.[3] As a preliminary comment, the Regulation applies if the smart contract at issue contains a valid and binding agreement: as such, in accordance with the autonomous definition of the Court of Justice of the EU (CJEU), the smart contract must include an obligation that is freely assumed between the parties.[4]

With regard to the material field of application, the aforementioned Regulation applies to disputes in civil and commercial matters. In this regard, the CJEU has rejected the notion that these matters can be identified by looking at the law of one or the other State concerned.[5]

[3] Regulation (EU) 1215/2012 of the European Parliament and of the Council of 12 December 2012 on jurisdiction and the recognition and enforcement of judgements in civil and commercial matters (recast).

[4] The Court of Justice referred to a precedent in which it stated that the notion of "contractual matter" pursuant to Article 5 point 1 of the then 1968 Brussels Convention, "could not include the case in which there is no obligation freely assumed by one party towards another" (Réunion européenne SA and Others v Spliethoff's Bevrachtingskantoor BV and the Master of the vessel Alblasgracht V002, 27 October 1998, C-51/97, European Court Reports 1998 I-06511, point 17).

[5] Court of Justice, 14 October 1976, in case C-29/79, Verbaeys-Biondi v. Unpublished commission; cf. also Court of Justice, 18 October 2011, in case C-406/08, Realchemie v. Bayer Crop Science AG, ECLI: EU: C: 2011: 666.

Conversely, it is necessary to have regard to the legal nature of the relationship brought before the court, excluding those concerning one of the matters expressly listed in Article 1.2 of the Regulation.[6]

Moreover, the said Regulation is applicable provided that the defendant is domiciled in a member state of the EU. If this is not the case, the internal rules on jurisdiction in each member state become effective again. As regards the rules on jurisdiction, the EU has established that the general principle of the Brussels I Regulation (recast) is precisely that of the defendant's domicile. Operationally, it seems that, if the subject of the dispute is a case governed by a smart contract, the domicile of the defendant, whether a natural or legal person, is difficult to identify. In fact, it seems unreasonable to think that the parties may decide to indicate this expressly in the contract: one of the added values of the use of DLTs is precisely that of sharing as little personal data as possible.

In the absence of an express (and correct indication) of the domicile, as already occurs for analogue and/or digital contracts, even for a smart contract a court could establish its jurisdiction if the defendant—if a natural person—is actually domiciled in the same state in which he was sued (Article 62.1). If not, the court would have to assess whether the defendant is domiciled in another member state, having regard to the definition of domicile given by the latter's national law.

The same uncertainties apply to the legal person considering that, as prescribed in Article 63 of the Regulation, one could alternatively refer to the statutory domicile, to the place where the legal person is established as well as to the place where the main business centre is located. The statutory domicile is the only legal criterion and it is easily available, as it is public; however, this is unsafe, as there is no European qualification of statutory domicile. In fact, particularly for companies with significant turnover, the headquarters are often located in favourable jurisdictions in

[6] Article 1.2 Regulation: "The following are excluded from the scope of application of this regulation: a) the status and capacity of natural persons, the property regime between spouses or arising from relationships that according to the law applicable to the latter they have effects comparable to marriage; b) bankruptcies, procedures relating to the liquidation of companies or other legal persons that are in a state of insolvency, arrangements with creditors and similar procedures; c) social security; d) arbitration; e) maintenance obligations deriving from family, kinship, marriage or affinity relationships; f) wills and succession, including mortis causa maintenance obligations".

which they do not actually operate. Conversely, the other criteria, being geographically localised, are difficult to find in the hypothesis where the legal person in question conducts activity using blockchains, which are, as such, decentralised in many nodes that may be anonymous and located in a number of jurisdictions.

Finally, a similar application difficulty arises, then, in the hypothesis of the sale of goods, for which the legislator has established ad hoc rules in Article 7.1 (b). With regard to the sale, the place of performance of the obligation in question shall be: "i) in the case of the sale of goods, the place in a Member State where, under the contract, the goods were delivered or should have been delivered; ii) in the case of the provision of services, the place in a Member State where, under the contract, the services were provided or should have been provided; iii) where the asset was or should have been delivered" (Article 7.1 b).

Case law confirms that the place must be determined on the basis of the provisions of the contract and, if there are no such provisions, the commercial terms and clauses that contain an explicit indication of the place of delivery may be considered. In their absence, the place is that of the material delivery of the goods by which the buyer has obtained or should have obtained the power actually to dispose of those goods.[7] However, in our case, the digital contract is concluded on the blockchain so that, even in the hypothesis of the purchase and sale of a tokenised asset, i.e. the purchase and sale of the digital representation of the consideration for the physical or intangible asset, the contract is considered to be concluded with the provision of consent or with the transfer to the buyer's virtual wallet of the token representing that given asset. In both cases, the certainty of the place in which the buyer actually obtains the availability of the asset is absent.

The analysis conducted so far leads to the exclusion of the application of the Brussels I Regulation (recast) if the subject of the dispute is a smart contract. Finally, the parties may appeal to the national judge only after having carried out the alternative dispute resolution remedies if they are

[7] Court of Justice, 25 February 209, in case C-381/08 Car Trim, ECLI: EU: C: 2010: 90, paragraph 44. Court of Justice, 9 June 2011, in case C-87/10, Electrosteel Europe SA v. Edil Centro SpA, ECLI: EU: C: 2011: 375, point 18.

stated as being mandatory in the smart contract itself (from settlement to so-called ADR procedures).[8]

Applicable Law

The smart contract also poses problems with regard to the applicable law, the identification of which is governed by the Rome I Regulation.[9] The arguments already made in the previous section regarding the Brussels I Regulation (recast) apply. Here, the chapter therefore examines the application of the connecting criteria of the Regulation to cases involving a smart contract.

With regard to the main connecting factor, the principle of the autonomy of will of the parties, the cornerstone of the Regulation in question (see premise 11), recognises the freedom of the parties to decide upon the law that applies to the relationship (Article 3.1). Operationally, however, it seems difficult to translate the will of the parties into an algorithm (Rühl, 2019; Chandler, 2019).

The main issue remains as to whether the choice is attributable to the party and not to the algorithm or to the person who designed it. For the provision of consent to the choice of law, a separate agreement is therefore required, negotiated and stipulated in traditional forms and in natural language (ISDA White Paper, 2020). The same limit applies in the case of an implicit choice in the sense that, although admitted by the Regulation in question, it must be clear from the provisions of the agreement or the circumstances. Both items of evidence are difficult to find in a legal instrument built with algorithms, such as software. Certainly, the law chosen by the parties is an essential prerequisite for verifying that the consent of the parties has been legally expressed.

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[8] Article 1.2 of the regulation excludes arbitration from the matters of application of the Brussels I bis Regulation but specifies in recital 12 that the judge: "This regulation should not apply to arbitration. Nothing in this Regulation should prevent the courts of a Member State having an action in a matter for which the parties have entered into an arbitration agreement, from referring the parties to arbitration or from suspending the proceedings or declaring the request and to examine the possible nullity, inoperability or inapplicability of the arbitration agreement, in accordance with its national law".

[9] Regulation (EC) 593/2008 of the European Parliament and of the Council of 17 June 2008 on the law applicable to contractual obligations (Rome I), OJ L 177, 4.7.2008, pp. 6–16.

The residual criterion is referred to in Article 4.1, which states that the law is that of the place where the lender of the characteristic obligation has his habitual residence—for example, the seller in the case of a sale (Article 4.1 a). The criterion of habitual residence then returns for other types of contracts (transport, consumers, insurance, and employment). In all cases, however, this concept requires precise legal identification, which is still lacking in European law. In fact, Article 19 merely specifies the notion of habitual residence for legal persons and for natural persons who operate as professionals; therefore, natural persons who are not professionals are excluded. Furthermore, as these are activities carried out by professionals, or entities operating on DLTs, it is difficult to identify the places that should be indicated as the habitual residence. The second paragraph of Article 19 then introduces for the branches a geographical criterion defined ex ante, in the sense that it sees the habitual residence as coinciding with the place where the branch is located. However, it is a specification that, as in all cases where it refers to a physical place, risks being of little use in smart contracts.

If it is impossible to identify the habitual residence, the criterion referred to in Article 4.4 could be applied, thus seeking the closest connection, namely, the place with which the case is most connected. For one (habitual residence) and for the other (closest connection) case, the use of blockchain technology makes the search complicated and the criteria difficult to apply (Rühl, 2019).

Smart Contracts: Comparative Perspectives

Civil Law

From the foregoing, it appears that EU private international law cannot immediately be used for identifying the jurisdiction and law applicable to disputes in civil and commercial matters concerning a smart contract. It is therefore necessary to see whether national courts, when called to settle a dispute, will legitimise the practice of entering into smart contracts to manage cross-border transactions, for example, by considering an extensive interpretation of the existing rules to these digital contracts. Clearly,

if the law of the forum applicable to the case excludes the legal validity of a smart contract, the use of EU private international law is precluded in itself.

In practice, the parties will probably agree on a national law to govern the digital contract by inserting a clause into the smart contract. Thus, the clause is translated into programming language. Nevertheless, in a comparative perspective, the state of play as to the validity and enforceability of smart contracts remains unclear (Procopie, 2021).

Over the last two years, civil law jurisdictions in the EU have begun to question the possibility of legitimising blockchain applications, and the new legal instruments that derive from them, particularly smart contracts (Poncibò, 2020b). There are many current initiatives and they therefore offer a promising field of exploration for comparative law scholars.

This subsection considers the law passed in Italy on smart contracts as a very good example of the cautious approach towards blockchain regulation that generally characterises civil law jurisdictions, especially in the EU. Since 2019, Italian law has defined DLTs and, interestingly, smart contracts.[10] It states that "(…) 2. A 'smart contract is defined as a computer programme that operates on technologies based on distributed registers and whose execution automatically binds two or more parties on the basis of predefined effects". Smart contracts may also meet the written form requirement following the computerised identification of the interested parties through the technical process designed by the public authority.

In the light of the above, a smart contract is therefore identified as a computer programme which, when executed, binds the parties. This assertion raises numerous legal questions concerning the protection of software, the role of blockchain (or platforms), to mention just a couple. More importantly, the paragraph in question then specifies that the effects produced by the smart contract are legally binding; one limitation of the provision is that it focuses on the effects, and not on the validity, of the constraint signed between the parties, namely on the smart contract

[10] See Article 8-ter in Law 12/2019, Conversion into law with amendments to the decree law 14 December 2018, n. 135, containing urgent provisions on support and simplification for businesses and the public administration (so-called Simplification Decree), in the OJ, General Series no. 36 of 02/12/2016.

itself. It is, therefore, still unclear whether the data formally entered in the smart contract has legal validity.

Similarly, French and German legal scholars seem to be very cautious in admitting that such a contract and programme may include binding obligations between the parties. They usually agree with their Italian colleagues in arguing in favour of limiting smart contracts to computer programmes for the automatic execution of contracts (Poncibò, 2020a, 2020b).

Common Law

With respect to the common law, it is interesting to note that a UK Jurisdiction Taskforce (UKJT) has been established to examine the legal meaning of smart contracts. On 9 May 2019, it launched a consultation to define and make public the Government's orientation in the field of new technologies and smart contracts.[11] In particular, the UKJT noted that a smart contract may, or may not, have binding effects between the parties depending on the circumstances of the case and in the light of English contract law. Thus, the concepts of offer, acceptance and consideration are likely to be relevant in this context. In particular, the UKJT intends to clarify whether, and in which circumstances, a smart contract may contain binding obligations for the parties.

Additionally, in the United States, some states, such as California, Delaware, Vermont, Nevada, Arizona, Hawaii, New Hampshire, and Illinois, have proposed the introduction of (and partly introduced) legislation aimed at legitimising the use of digital (smart) contracts (Verstraete, 2019). Legal scholars appear to favour such clarification by formal law while the legal meaning of a smart contract mainly depends on the circumstances of the case. The US Digital Chamber of Commerce

[11] UKJT, *Legal Statement on cryptoassets and smart contracts*, 2019, https://35z8e83m1ih83drye280o9d1-wpengine.netdna-ssl.com/wp-content/uploads/2019/11/6.6056_JO_Cryptocurrencies_Statement_FINAL_WEB_111119-1.pdf (accessed June 1, 2021).

specifies: "[t]he term "smart contract" is itself imperfect. A smart contract is neither smart, nor is it necessarily a contract".[12]

In such a context, California has, for example, expressly confirmed that a smart contract falls under domestic contract law. Notably, in September 2018 the California Assembly passed Bill no. 2658 amending the California Civil Code. Section 1633.2 states that Contract "means the total legal obligation resulting from the parties' agreement as affected by this title and other applicable law. "Contract" includes a smart contract. (p) "Smart contract" means an event-driven programme that runs on a distributed, decentralised, shared, and replicated ledger that can take custody over, and instruct transfer of, assets on that ledger".[13] Basically, the Californian Civil Code has assimilated smart contracts and traditional contracts, clarifying that the former are distinguished only by their particular form, based on coding (Verstraete, 2019).

Comparative Analysis

In a comparative analysis, it seems that both EU member states and non-EU states have been reluctant to regulate this innovation (Finck, 2018). The approach may be explained by the fact that the DLTs at the basis of the smart contract are still in a phase of development. This technology is not mature and it should not be held back by the introduction of excessively rigid and binding regulatory definitions. Moreover, it should also be underlined that case law on the legal nature of smart contracts is definitely scarce and is therefore not particularly useful in answering such an important research question. Accordingly, Lord Sales confirms in a recent speech that "The fundamental issue which smart contracts pose for the judiciary is that contract law, to date, has not developed in response to

[12] Chamber of Digital Commerce (US), *Smart contracts legal primer—Why smart contracts are valid under existing law and do not require additional authorization to be enforceable*, 2018, https://digitalchamber.org/wpcontent/uploads/2018/02/Smart-Contracts-Legal-Primer-02.01.2018.pdf (accessed June 1, 2021).

[13] The Civil Code of California is a collection of statutes for the State of California. The code is made up of statutes which govern the general obligations and rights of persons within the jurisdiction of California. The full text of the Bill no. 2658 is available at https://legiscan.com/CA/text/AB2658/id/1732549.

contracts generated and monitored automatically by machines. The legal doctrines and concepts which we apply to the cases that come before us are not necessarily equipped to deal with the questions that these contracts will generate. The Law Commission, an independent statutory body set up to keep national law under review and to recommend reforms, is currently considering smart contracts" (Lord Sales, 2021).

Turning to legal scholars, there is extensive literature on the definition of smart contracts and, at this stage, the general view in England and in common law countries, including the US, is that smart contracts are contracts where some terms are capable of being automatically performed; they meet the requirements for an enforceable contract under English law by which two or more parties intend to create a legal relationship and have each given something of benefit; they should not be treated as being different in principle from conventional contracts (ISDA White Paper, 2020, p. 5). In contrast to the common law position, civil law scholars have emphasised that technology is the essential part of smart contracts and for this reason there are clear instances in which smart contracts have been considered as computer programmes to execute contracts.

Self-Regulation and Technology

Smart Contracts Standardisation

Notwithstanding the lack of a clear international legal framework, the practice of relying on smart contracts is particularly widespread in international trade (Ream et al., 2016). Most important, this occurs in the absence of a clear legal framework at the international and domestic levels. It therefore seems that security in operational processes, as well as reliability in the operation of technology, are the characteristics that now induce parties to commit themselves by entering into a smart contract.

Therefore, digital trust (even in relation to technology) takes on a primary role in inducing economic operators to enter into a contractual relationship in international trade and finance (Werbach, 2018). In fact, regardless of the uncertain regulatory framework, economic operators

are increasingly ready to accept digital contracts for cross-border trade due to their characteristics, which include cost reduction, automation and standardisation. Additionally, smart contracts do not require trust as previously noted. In the case of smart contracts, economic operators (i.e. private entities) are substantially contributing to drafting, coding, managing and executing smart contracts for international trade and finance. This occurs primarily through the process of the international standardisation of smart contracts: a process that is mainly driven by industries themselves rather than public institutions.

Indeed, contract standardisation has a long history, which begins with the emergence of standard form contracts (SFC) for consumers and businesses. Technology and globalisation have fostered the practice of developing standard models of contracts in certain industries. Specifically, the chapter emphasises that cross-border contracts in the fields of banking and finance, energy, and construction, to mention just a few, have been the subject of an international standardisation process through the efforts of the relevant industry and economic operators. Furthermore, many of these contracts have become almost identical internationally (e.g. the standard contracts of the International Federation of Consulting Engineers, FIDIC; see Bari et al., 2019).

Here, the point is that, due to the lack of legal certainty, smart contracts are currently undergoing an international standardisation process and are being regulated accordingly. The drivers of this process aimed at overcoming the shortcomings of the law are: coders and programmers, and economic operators and their associations (e.g. ICC, ISDA). They provide smart contract models and standardise them in the relevant industry.

Indeed, the divergence of smart contract protocols depending on the blockchain at issue (i.e. the problem of lack of interoperability between blockchains) can be an additional motivation for identifying some standards that economic operators could adopt internationally, thereby avoiding chaos in terms of the huge number of different models of smart contracts.

Programmers

Programmers are cooperating with each other in order to design standards for digital contracts on the blockchain. One of the main examples is Ethereum ERC-20 (ERC—Ethereum Request for Comments) standard smart contract (Ansari & Kulkarni, 2020). Using the ERC-20 standard makes it possible to create a token exchange system on Ethereum: the "transfer function" is the key feature, as it ensures direct fund transfers according to the receiver's address and the number of tokens being sent. The transfer return value is supplied as a report on receipt of the tokens. All the functions are executed by the Ethereum Virtual Machine, powered by the computational power of every Ethereum node. This gives ERC-20 tokens the ability to be involved in the automation of complex business processes and tasks in cloud-like virtual machines. It is interesting to note that, in its current form, ERC-20 is based upon cooperation between programmers and nodes—physically located in any jurisdiction—who continuously share views, comments and suggestions for the best drafting and management on-chain of smart contracts on Ethereum.

Smart Incoterms®

Economic operators are also significantly contributing to regulatory design through international standardisation. This section considers some leading cases at the international level (ICC and ISDA).

In September 2019, the International Chamber of Commerce (ICC) published Incoterms 2020, in force from 1 January 2020. In that regard, it should be noted that the International Chamber of Commerce initially signed an agreement with Perlin, one of the most influential blockchain certification platforms, only then to develop "a customisable, self-executing digital sales agreement, incorporating the new Incoterms rules. The incorporation of smart Incoterms® rules, or Smart INCOs, will help facilitate trade by reducing costs and barriers faced by importers and exporters worldwide, notably, small and medium enterprises" (ICC,

2019). The ICC has recognised that blockchain technology can facilitate trade, making it more secure and thus engendering trust in traders. This technology in fact highlights all the steps in the production chain, thus simplifying cross-border imports and exports. This new "trust" in the chain should also facilitate exchanges between small or medium-sized economic operators (Werbach, 2018). The latter can in fact rely upon the fact that a contract signed in the smart form is self-executing, thus being more likely to be executed, irrespective of any recourse to the judicial authority (Dimitrieva & Schmidt-Kessen, 2019). This final step often involves particularly high costs.

Smart Derivative Contracts

In this section, we also note that the case of smart derivative contracts is worthy of particular attention as, notwithstanding the peculiarities of finance, it offers a promising example of the possible role that may be played by private entities and self-regulation (i.e. soft-law) in this respect. In finance, the need for regulatory reporting, portfolio reconciliation and a large number of transactions is pushing a trend towards transaction automation which could save money and time. Furthermore, derivative contracts are highly technical in nature, with the parties' primary obligations being payments to one another, which can be accomplished by debiting accounts (money or securities), making them especially well-suited to automation (OECD, 2020; Guo & Liang, 2016; Auer, 2015).

Thus, the International Swap Derivatives Association (ISDA) is leading the field in terms of contract digitalisation and standardisation. In fact, the ISDA has promoted the standardisation of contractual documents on derivatives with the aim of increasing efficiency and avoiding unnecessary complexity in cross-border transactions. In practical terms, the ISDA has released a set of legal guidelines for smart derivatives contracts which are intended to explain the core principles of ISDA documentation and raise awareness of important legal terms that should be maintained when a technology solution is used in derivatives trading.

It should also be noted that these guidelines define the terms of a smart derivatives contract (ISDA White Paper, 2020, p. 5).

More specifically, in January 2020, the ISDA published a White Paper entitled "Private International Law Aspects of Smart Derivatives Contracts Utilising Distributed Ledger Technology" ("ISDA White Paper"). Co-authored with Clifford Chance, R3 and Singapore Academy of Law, the ISDA White Paper discusses the private international law, or conflict-of-law, aspects of derivatives contracts governed by the laws of Singapore, and of England and Wales, involving distributed ledger technology. Indeed, DLT systems are frequently borderless, allowing multiple users or participants to exchange records in a shared database that may be based in multiple jurisdictions. The ISDA has also published three additional papers covering French law, Japanese law, Irish, and New York law.[14]

Conclusions

In the light of the above, it is possible to draw some preliminary conclusions.

Firstly, smart contracts may facilitate cross-border transactions, but they also pose serious challenges to contract law. For instance, decentralisation makes it difficult to identify the parties or their location, and it implies a fundamental change towards a new understanding of trust in business. Additionally, self-execution offers a great opportunity for implementing any duties included into the contract, but this attribute may also place many obstacles before the parties.

Secondly, legal scholars struggle to reach an agreement on the legal meaning of smart contracts, and they also question whether smart contracts can be integrated within both European private international law and national contract laws. With respect to digital (smart) contracts, the state of play of EU law appears to be unclear and fragmented. Moreover, the chapter questions whether, and to what extent, smart contracts

[14] ISDA publications are available at https://www.isda.org/2019/10/16/isda-smart-contracts (accessed May 14, 2021).

can be assimilated to traditional contracts and thus be governed by the contract law of a given legal system.

Thirdly, in the absence of a clear legal framework, in the chapter we noted that economic operators and programmers are significantly contributing to drafting, managing and executing digital (smart) contracts. Basically, they are relying on technology and industry self-regulation in setting standard smart contracts for specific sectors of the industry, as in the leading cases of smart Incoterms® rules and smart derivative contracts.

Finally, in the chapter, we have observed the development of this *lex mercatoria ex machina* where merchants are fostering cross-border trade by relying primarily on technology and digital trust. Future directions in research should investigate this fundamental change of the law of merchants in the digital age.

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