



THE INTERPRETATION OF SMART CONTRACTS IN THE EU AND THE USA

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Abstract. This article argues that the current rising trend in the use of smart contracts requires a radical update of existing legislation. It intends, in the first instance, to outline a notion of the “smart contract”, and then to highlight different understandings of it in the EU and the USA. This article analyses the existing legislation specifically enacted to address smart contracts. From a comparative perspective, the issue of how the existing contract law adapts to regulate and enforce smart contracts in the common and civil law countries is discussed. In light of this, the author analyses whether a smart contract conforms with the common law and civil law requirements for the formation of a valid and legally binding contract. The author concludes that the common principles of traditional civil law will likely apply to agreements memorialised in code. This paper also outlines the notion that the emergence of “crypto-legal structures” is required due to the peculiarities of the incorporation smart contracts into different legal systems.

Keywords: smart contract, crypto-legal structures, legal recognition, judicial recognition, blockchain.

Introduction

The current stage of social and economic development is characterised by the profound impact of technologies. In order to keep up with technological progress, the legal system is constantly developing and improving: new norms are being created and existing ones are being changed; and gaps and contradictions in legislation are being eliminated. Sometimes, however, economic and social relations develop more rapidly than the legal norms regulating them. The most striking example is blockchain technology, contributing to the rise of smart contracts. The origination of smart contracts all over the world requires the radical update of existing legislation, or even the development of new legal avenues in order to regulate the market for new objects of economic relations.

At present, the legal nature of a smart contract both at the national level of states and at the international level is not clearly defined. Therefore, an analysis of smart contracts in various jurisdictions is very timely.

The academic literature has not yet addressed the nature of smart contracts by considering different understandings of them in the EU and the USA. Existing legal literature that is dedicated to smart contracts can be classified into three main groups. The first group of authors tend to explore the technology underlying smart contracting and provide resemblances to existing legal doctrines. In particular, this group includes: Kevin Werbach and Nicolas Cornell (2017), who came to the conclusion that smart contracts could not displace contract law; and Max Raskin (2017), who stated that smart contracts are simply a “new form of preemptive self-help”. The second group of authors focuses primarily on the drawbacks of smart contracts. For instance, according to James Grimmelman (2019), all smart contracts are incomplete and ambiguous, while Jeffrey M. Lipshaw (2019) argued that traditional contracts will continue to exist alongside smart contracts. The final group of scholars analyse the regulatory challenges arising from smart contracts. For example, the work of Reggie O’Shields (2017) presented the legal

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and regulatory issues connected with the application of smart contracts, and Adam J. Kolber (2018) explored third-party harms arising from smart contracts and possible regulations.

However, as yet no research has been undertaken on the concept of smart contracts in the EU and the USA. This study is a first attempt to analyse the different approaches to the concept of a smart contract in these two main Western legal traditions. The first part of this article will present a broad approach to the smart contract, identifying a workable definition of the concept. The second part of the article will then consider the understanding of smart contracts and their regulation in the EU and the USA, where the adoption of this concept will be identified through legal and judicial recognition. The understanding of this form of contract and its regulation in the EU and the USA differs, and the reasons for these distinctions can be found in the different legal systems and certain peculiarities of legislation in the EU Member States and the USA. While there are many differences between common and civil law countries, this article only covers a few key conceptual differences. In particular, this article will consider whether a smart contract conforms with the common and civil law requirements for the formation of a valid and legally binding contract.

The ultimate goal of this paper is to evaluate how the existing contract law in the common and civil law countries adapts to regulate and enforce smart contracts in the absence of a uniform legislative framework regarding smart contracts. This will be followed by a proposition as to how to harmonise the US and EU approaches to smart contracts.

In this paper, a combination of traditional legal research methods with an empirical study considering the regulatory framework of smart contracts will be undertaken. For mapping the differences in understanding smart contracts in the US and the EU, the comparative law method is used.

1. Defining smart contracts and their key features

Any discussion about smart contracts and their impact on today's contract law must begin by identifying a workable definition of the concept. As should become apparent, there is much debate and confusion around the notion of smart contracts.

Initially, the concept of a smart contract was introduced by a well-known American scientist, a specialist in the field of law and cryptography, Nick Szabo in 1994. According to Szabo, a smart contract should be understood as a computer program that fulfills the provisions of the contract. Herewith, the goals of smart contract are to execute the terms of the agreement, including payment conditions, confidentiality etc.; diminish the need for intermediaries. Related economic goals include lowering fraud loss, arbitration and enforcement costs, and other transactions costs (Szabo, 1994). Thus, smart contracts allow the digital codification of entire legal institutions, and ensure that the corresponding rights and obligations are automatically enforced

More than two decades later, on 30 July 2015, the first open digital platform, Ethereum, was launched, which allowed for the creation of decentralised online services – called blockchain technology. Ethereum is a decentralised platform for developing applications based on blockchain and smart contract principles. Before the Ethereum platform, applications based on blockchain technology only performed a highly specialised set of actions. This web-based software allows a program written in any programming language to be ran. This makes the process of writing various applications on such a platform simple and highly efficient. Ethereum makes it possible to develop an unlimited number of applications on its own basis, rather than creating a new blockchain every time. The rules of Ethereum technology allow the user to register any type of transactions with any kind of assets without restrictions, excluding intermediation between the parties of smart contracts (Yurasov & Pozdnyakov, 2018). In this connection, the parties conclude smart contracts without classical legal procedures and the banking rules for financial transactions.

Hereby, due to the nature of this new phenomenon and the complex technology with which it is associated, in legal science there is no consensus about the definition of smart contracts and their legal nature. It should be noted that the smart contract category can be defined in the technical and legal senses. In other words, smart contracts may be: 1) computer code that does not represent any legal contract but simply executes a predefined logic; or 2) computer code that has certain legalese properties, i.e., a program with a predefined logic based on legal structures

that is expected to act in a certain way, or the (partial) execution of legalese (e.g., a contract) through computer code, where the code resembles the legalese (Lennart, 2020).

For some, a smart contract does not refer to a contract in a legal sense, but instead to a computer code that automates business processes without the need for recourse to the courts of law to resolve disputes – this is the so-called smart contract code. For instance, Novoselova (2017) indicates that “the technical side of the smart contract is reflected in its definitions as a type of encoding, a way of functioning of the blockchain; as a code fragment that is implemented on the blockchain platform and initiated by the blockchain-transactions and organizes the entry of records into the database”. Descriptions of the conditions and the execution algorithms of smart contracts are issued in the programming and use of mathematical tools (for example, cryptography with a public key), which eliminates the ground for discrepancies in the interpretation of the terms of the transaction. Execution is also carried out automatically due to the work of pre-set parameters in a computer system without the participation of parties. Records of obligations and committed transactions are automatically stored in distributed format and cannot be changed by anyone. This approach stems from the idea that a smart contract is only a piece of software – only a technical phenomenon, which it is not possible to regulate by legal means.

For others, however, a smart contract is a legal contract that is partly or wholly represented and/or performed by software. In other words, the contractual obligations of a party to the contract are discharged through the automated performance of the software. However, it should be noted that rather than viewing smart legal contracts and smart contract code as two separate concepts, the reality is that there is a relationship between them: for a smart legal contract to be implemented, it will need to embed one or more pieces of code designed to execute certain tasks if predefined conditions are met – that is, pieces of smart contract code. Smart legal contracts, therefore, are functionally made up of pieces of smart contract code, but, critically, exist under the umbrella of an overall relationship that creates legally enforceable rights. As a result, every smart legal contract can be said to contain one or more pieces of smart contract code, but not every piece of smart contract code comprises a smart legal contract (ISDA & Linklaters, 2017). In particular, the French researcher Guerin (2017) points out that one should distinguish between a program (a smart contract) that operates on the blockchain platform and a traditional contract. As a result, the smart contract is, as it were, overlaid on the traditional civil contract. Such an approach is based on the dual nature of smart contracts, including technical and legal aspects.

Technically, a smart contract is created by a transaction that contains the contract’s byte code in the data field. In turn, the contract byte code for forming a transaction can be obtained by compiling from the source code of the smart contract. To be more specific, source code is connected with the statements created in the programming language which are generated by a human/programmer. Source code is easy to read and modify; it is provided to the language translator, which converts it into machine-understandable code, called machine code or object code. The computer cannot understand direct source code, but understands the machine code and executes it. The intermediate code between the source code and machine code is termed byte code; it is a low-level code that is the result of the compilation of a source code which is written in a high-level language. Byte code is also understandable only by the machine.

In this article, references to smart contracts are intended as references to a smart legal contract, which require a deeper analysis. In the literature, there are different approaches regarding the legal nature of smart contracts. Despite the existing definitions of a smart contract, the doctrine does not provide an answer to the question: is it possible to consider a smart contract as a contract, and if so, what type of contract is it?

Efimova and Sizemova (2019) clarify that the place of the smart contract is among special non-independent contractual designs that reflect the features or the special legal consequences of any civil law contract if it meets the criteria specified by the law. Other authors define a decentralised smart contract as any digital agreement which is: (a) written in computer code (thus, a piece of software); (b) run on blockchain or similar distributed ledger technology (thus, decentralised); and (c) automatically executed without any need for human intervention (thus, smart) (Caria, 2019). Taking into account both basic concepts and emphasising the aspects of automation and enforceability, some authors have defined smart contracts as an agreement, automated by the computer and enforced by legal means or computer code actions (Clack, Bakshi & Braine, 2017). Other scholars and legal operators have defined smart contracts as: “self-executing electronic instructions drafted in computer code”

(O'Shields, 2017); "contracts that are represented in code and executed by computers" (Mik, 2017); and programs that execute contractual obligations and use legal remedies (Tjong Tjin Tai, 2018).

Savelyev (2016) believes that smart contract is a legal agreement and suggests the following definition: a contract, concluded in the electronic form, performed on the blockchain platform, which provides the self-enforceability of the provisions, upon arising conditions embedded in it. Savelyev also claims that a smart contract can be considered as an agreement having a legally-binding nature for several reasons. Firstly, it applies to relations related to digital assets, which represent economic relations, the object of civil law. Secondly, despite the automatic performance of the smart contract, the will of the party is necessary to make it effective. Finally, the mere fact that the contract is concluded by electronic means does not mean that it is not a contract.

To summarise, there is a limited consensus on a core definition, according to which smart contracts have a solely electronic nature and feature the implementation of software; some add to this definition the requirement that such contracts run on blockchain or similar distributed ledger technologies and, thus, may be called decentralised smart contracts.

It is the view of this article that, in order to elaborate a clear definition of a smart contract, it is necessary to compare it with the traditional contract, highlighting its distinctive features. For instance, in the classical agreement it is required to identify their parties to provide a valid consent. However, public blockchains assume decentralised transactions because of countless amount of participants. Moreover, digital identification of the participants does not mean the same as the real identification with the use of official identity documents (Vidal, 2018). Nevertheless, this problem is not unbridgeable because of the establishment of identification requirements. In other words, the identity of the parties, acting pseudonymously, could be established through the link to their personality.

It also has to be emphasised that another feature distinguishing a smart contract from a traditional one is its self-enforceability. The automated fulfilment of obligations involves the implementation of obligations not by the actions of the parties, but with the consent of the parties with the help of an electronic platform through the introduction by the parties of the appropriate commands (contractual conditions). Due to this, it becomes possible to make legal relations self-enforceable. On the one hand, this could be regarded as an advantage of the smart contract since an algorithm (computer program) is able to independently fulfil obligations and track their fulfilment. On the other hand, there are certain difficulties associated with the self-enforceability of smart contracts. Unlike the performance of traditional contracts, the performance of a smart contract cannot be stopped – neither voluntarily by the parties (they cannot breach or amend it), nor by any official authority or other supervisor (Paech, 2017). In this regard, a smart contract is described as technically binding for all the parties independently of the change of intentions of the parties or circumstances (Savelyev, 2016). Therefore, the automatic nature of a smart contract creates certain difficulties, one of which is that the smart contract cannot be changed and neither party can suspend execution under it. Further, it is not clear how to relate the impossibility of suspending performance under a smart contract to certain legal norms, such as good faith or unilateral refusal to perform the contract.

Also unclear is the situation related to liability in case of system errors. In this case, the question as to the party responsible for system errors remains unclear: the parties themselves, the protocol/program developer, or third parties. In addition, given that a smart contract cannot be forged, destroyed, or changed, the question arises as to the possible way of renegotiating the terms of the agreement due to a significant change in circumstances. In order to solve this problem, this article proposes to initially prescribe in the program code of the smart contract the possibility of changing the terms of its execution or the participation of a third party. Moreover, the development of the idea of the automatic enforceability of a smart contract has led to the emergence of a new category of entities that are not parties to a contract implemented through digital technologies but still have the ability to influence its execution, called oracles. According to M. Mekki (2019), an oracle is a person or computer application that connects events that occur in the virtual world of the blockchain and events that occur outside of it, in the real world. The oracle can be an individual or legal entity, a program, a physical device, etc. The oracle can also be an organisation that has the necessary competence in a particular field, including legal professionals such as notaries, lawyers, or bailiffs (Gossa, 2018). Such individuals are necessary to collect, process, certify, and include blockchain information that is important for the implementation of a smart contract, which is located

outside the contract, in the physical world, and it is the oracles who are able to solve the difficulties associated with the self-enforceable nature of smart contracts.

It has to be noted that the form of conclusion of the smart contract itself is not new, which converges it towards the traditional contract. Thus, the current legislation of the USA and the EU provides for the possibility of concluding agreements in electronic form (Kirillova, Zenin, Kovaleva, Baskakova & Fatkulin, 2020). Accordingly, contracts can also be concluded in the form of program code: the legislator equates the electronic form with the written form. When considering smart contracts as a written form of a contract, it is worth recalling the legal prerequisites for the emergence of such contracts and this theory in general, namely the UN Convention on Contracts for the International Sale of Goods (1980), where Article 13 provided for the possibility to recognise the written form and the exchange of messages by telegraph and teletype, which was later supplemented through the prism of international rules for the interpretation of trade terms (Incoterms, 1990). These rules recognised the importance of computer communication for contractual relations, and also specified that both parties to the agreement should have the same legal position in relation to this process – i.e., mutual recognition of the electronic form of the transaction.

In general, it can be concluded that a smart contract is not a separate type of obligation or contract. It is more acceptable to understand a smart contract as a new way to fulfil obligations entered into the form of software code. Smart contracts should be considered as contracts in the legal sense, with the definition of a smart contract as any digital agreement that: a) is written in computer code (software); b) works on the blockchain or similar distributed book technologies (decentralised); and c) is automatically executed without the need for any intermediary.

2. On the meaning of smart contracts in common and civil law traditions: differences in two approaches

The term *legal structure* refers to a legal system's "skeletal framework; it is the permanent shape, the institutional body of the system, the tough rigid bones that keep the process flowing within bounds" (Friedman, 1969). Essentially, each "[s]tructure becomes . . . custom or habit" such that "social meanings clump about each structure," giving them "social-psychological and cultural boundaries" (Friedman, 1969). As a result, structures are "patterns of behavior that persist over time – vessels or containers that the culture slowly welds into shapes" (Friedman, 1969). It could be stated that legal structures are closely connected with legal traditions, and that the roots of a legal system emanate from the unique historical and political context of that system and thus significantly influence the form of legal structures in the system.

Continental European civil law was developed on the codification of Roman law, therefore the word *system* is connected with the substantive doctrine, stated in the codes with common principals and detailed rules. In English common law the word *system* is associated with the law in its actual performance, finding ways to solve the disputes in accordance with previous judicial decisions (Brouwer, 2018). Thus, the compared legal traditions have interpreted the *system* in a different way. This incongruity leads to the formation of two approaches to the *legal unity*. In a civil law countries legal unity means following the statutory law, while in a common law countries – compliance with the previous court decisions (Brouwer, 2018). Thus, in the Roman-Germanic legal family, codification is the main form of legislative systemisation. Meanwhile, the common law legal system is characterised by the sociological approach to law, under which *law* is understood as a highly organised form of social control which is implemented by judicial and administrative control (Karamanukyan, 2018).

At the present time, when the state takes the obligation to resolve conflicts in industrial society, law becomes the most important means of exercising social control. All other types of social control today operate under the supervision of and in accordance with the requirements of law. The goal of law is to settle social conflicts and achieve civilised relations between people. This right should not serve to divide members of society, but, on the contrary, to strengthen harmony and cooperation between them. In this regard, the leading role belongs to the judges who formulate such a concept of law in the process of jurisdictional activity. They "fill" the legislation with rights, making appropriate decisions and acting in this case as subjects of law-making. As a result, laws are recognised by the courts as living organisms, changing and upgrading through judicial decisions (Karamanukyan, 2018). In other words, the courts, in adjudicating legal disputes and carrying out justice, create precedents via the interpretation of laws and regulations, adapting them to a changing society.

While analysing the differences between these two systems, it is notable to mention the essence of such a principle of law as “freedom of contract”. The heart of common contract law lies in the freedom of commerce and the freedom to conclude contracts. For the common law countries, freedom of contract means, first and foremost, the economic freedom to voluntarily engage in economic transactions without any risk of statutory interferences (Lawrence, 1994). Here, the emphasis is on the formal nature of legal consumer rights, where human capital is used to stimulate future spending and economic growth. Unlike in common law jurisdictions, today’s conception of freedom of contract in the EU can best be understood as a consumer protection conception that restricts freedom of contract in commercial transactions through statutory regulation. Hence, compared to the civil law approach, the common law view on the role and function of contract law is much more economical. Its primary purpose is to guarantee freedom of contract, not to protect the rights of consumers.

It should also be emphasised that trends in civil law countries focusing on the principle of good faith (a general principle of law) are not shared by common law countries. To be specific, civil law countries recognise the concept of good faith, distinguishing between moral and legal norms. The components of good faith, as a notion belonging to the matter of law, are based on honesty as a manifestation of conscience within moral norms, which is translated as a value that entails the compliance of individual life with moral norms. In order to invoke good faith, all its attributes must be found both anterior to and simultaneous with the moment when the agreements meet to perfect a legal act, and subsequently for its execution (Dobrilă, 2012). Most European civil codes contain general provisions on good faith as a concept and, also, as a concrete application in contractual relations. In particular, following the principle of good faith, each party has a duty at the pre-contractual stage to disclose any information that is relevant and material to the other party’s consent to enter the transaction. For instance, a party has a duty at the pre-contractual stage to disclose any information that is relevant and material to the other party’s consent to enter into the transaction, according to Article 1112-1 of the French Civil Code. The parties may neither limit nor exclude this duty. In addition to imposing liability on the party who had the duty to inform, their failure to fulfil this duty may lead to the annulment of the contract under the conditions provided by Articles 1130 and following. According to Section 242 of the German Civil Code, contracts must be negotiated, formed, and performed in good faith. This is according to the so-called principle of good faith and fair dealing. In case of breach of pre-contractual duties, liability based on Section 311 of the German Civil Code is possible (*culpa in contrahendo*, a common contract law concept meaning “fault in conclusion of a contract”).

On the contrary, in the common law countries there exists no legislation according to which there is an obligation to negotiate contracts in good faith, and no general duty to disclose information at the pre-contract stage. Each party should take care of its own interests by making necessary inquiries. In particular, in the leading English House of Lord’s case *Walford v. Miles*, a pre-contractual duty to negotiate in good faith was denied on the ground that this would be inconceivable with the nature of negotiations in which each party pursues its own interests. An agreement according to which parties decided to negotiate in good faith is not effective in real life. “Negotiations are in existence either party is entitled to withdraw from these negotiations, at any time and for any reason. There can be thus no obligation to continue to negotiate until there is a ‘proper reason’ to withdraw. Accordingly, a bare agreement to negotiate has no legal content” (*Walford v. Miles*, 1992). American courts have also largely refused to recognise the duty to negotiate in good faith in the absence of additional procedural deficiencies. Some courts refuse to find contracts unconscionable per se, demanding additional, specific evidence that the consumer did not have a meaningful opportunity to read and understand the contract or to request information they were interested in (*Westmoreland v. High Point Healthcare Inc.*, 2012). For example, the New Jersey Supreme Court held in *Stelluti v. Casapenn Enterprises* (2010) that a “fairly typical adhesion contract” could not be found procedurally unconscionable where the complaining consumer had ample time to review and consider the contractual provisions, and could have contracted elsewhere for the same services with less onerous terms.

All things considered, the legal systems described above have inherent conceptual differences which could affect the legal approach to a smart contract.

Firstly, in the common law countries there is a need for greater awareness about the main conditions of the smart contract. Due to the lack of codified acts, the participant has the responsibility to provide in advance all the details of the smart contract in a clear and accessible form. This conclusion is inevitable because a party does not ordinarily owe a general duty to disclose to the other party – each party should take care of its own interest by making necessary inquiries. In contrast, in the civil law countries, the participant shall be bound to fulfil the

performance in accordance with the requirements of good faith, disclosing any information that is relevant and material to the other party of the smart contract.

Secondly, different approaches to such terms as system and legal unity in general can cause difficulties associated with the incorporation of smart contracts into the current legislation. In that respect, common law countries due to the flexibility of its law should deal with blockchain technologies more effectively. A common judge has the right to apply certain general principles of law to the to new technology (Moringiello & Reynolds, 2013). Writing for the California Supreme Court, Justice Tobriner explains that it is necessary to consider the new case, taking into account the circumstances in which it arises. This statement, in the light of development of new technologies, has become obvious. (*Steven v. Fid. & Cas. Co.*, 1962).

As a result, the nature of the challenges involving the incorporation of smart contracts into the law is different. Common law countries call for the careful application of existing precedents to the new cases due to the flexibility of the classical civil law. Meanwhile, in the civil law jurisdictions the creation of the new legal rules is necessary.

3. The recognition of smart contracts

The preceding paragraphs provide separate analyses of the understandings of the notion of a smart contract and its features in the common and civil law countries, emphasising conceptual differences. Having discussed them, this paper now turns to considering perhaps the most difficult of issues with respect to smart contracts: how the existing contract law adapts to regulate and enforce smart contracts. In this regard, it should be noted that the legal nature of smart contracts in the national laws of states is not clearly defined, which makes it possible to use this construction in different ways. Recognition of smart contracts can be achieved by two different regulatory alternatives: enacting special provisions tailored to smart contracts; or abstaining from this strategy, leaving the question to the judiciary which should examine the legal status of smart contracts on a case-by-case basis by applying the general principles of contract law.

3.1. Legal recognition: the current legal framework

An international legal framework specifically designed for smart contracts does not exist (Mukherjee, 2018). However, the topic is clearly under consideration at the legislative/regulatory national level. Thus, several states in the USA have recently turned their attention towards smart contracts.

For example, in the State of Arizona, a smart contract is defined as: “an event-driven program, with state, that runs on a distributed, decentralized, shared and replicated ledger and that can take custody over and instruct transfer of assets on that ledger” (Arizona ALS 97, Arizona Sess. Laws 97, Arizona Ch. 97, Ariz. HB 2417, 2017).

The State of Tennessee modified and expanded on this definition, and defined a smart contract as: “an event-driven computer program, that executes on an electronic, distributed, decentralized, shared, and replicated ledger that is used to automate transactions, including, but not limited to, transactions that:

- (A) Take custody over and instruct transfer of assets on that ledger;
- (B) Create and distribute electronic assets;
- (C) Synchronize information; or
- (D) Manage identity and user access to software applications”.

(State of Tennessee, Public Chapter No. 591, Senate Bill No. 1662, 2018).

A note following the Wyoming statute (Chapter 29 – Digital Assets, Section 34-29-103) provides that:

- (a) A smart contract, record, or signature could not be considered as not legally binding only because a blockchain was used to create, store, or verify the smart contract, record, or signature.
- (b) In a proceeding, evidence of a smart contract, record, or signature must not be excluded solely because a blockchain was used to create, store, or verify the smart contract, record, or signature.
- (c) If a law requires a record to be in writing, submission of a blockchain which electronically contains the record satisfies the law.
- (d) If a law requires a signature, submission of a blockchain which electronically contains the signature or verifies the intent of a person to provide the signature satisfies the law.”

Moreover, the states of Delaware (Delaware S Res Bill 69, 2017), Vermont (Vermont S Res Bill 135, 2017), Nevada (Nevada S Res Bill 398, 2017), Hawaii (Hawaii HR Bill 1481, 2017), New Hampshire (New Hampshire HR Bill 436, 2017), Illinois (Illinois HR 120, 2017), and California (Assemb. B. 2658, 2018) have all sought or seek to pass legislation to recognise and capitalise upon the use of smart contracts and blockchain technology (Catchlove, 2017). Thus, these states recognise the legally binding effects of smart contracts that are fully automated and executed on a blockchain, even if there is no corresponding traditional contract in word-format. Therefore, parties to a smart contract might be able to ensure that their smart contract is legally binding if they elect the law applicable to the contract to be that of Arizona, Delaware, Tennessee, or any other jurisdiction that recognises the legally binding effects of smart contracts.

At the EU level, it is important to note that uniform legislation does not exist today. However, at the national levels of several EU Member States, legislative frameworks have already been passed in order to recognise the legal effects of smart contracts. For instance, lawmakers in Monaco recently approved a bill that creates a legal foundation for ICO. Law No. 1009 of 10 March 2020, voted in on 16 June 2020, establishes a legal framework for smart contracts by stating that they “constitute legal acts and produce effects of law”, and by adding that the inscription of a legal act in a blockchain (chain of blocks) is presumed to constitute a faithful, enforceable, and durable copy of the original, bearing a certain date.

Moreover, the legal structure of a smart contract in Italian national legislation is of particular interest. In Italy, the terms *smart contract* and *distributed ledger technology* were enshrined in the Law “On Urgent Provisions for Supporting and Simplifying the System of Business and Public Administration”, which was published on 12 February 2019 in the *Official Gazette* of Italy. This law defines, for example, distributed registry technologies as technologies and information protocols that use shared, distributed, reproducible, and simultaneously accessible registries, decentralised and encrypted, that allow data to be registered, authenticated, updated, and stored, regardless of whether it is encrypted or not, and that cannot be changed or tampered with. This law also provides that the storage of electronic documents using distributed registry technologies becomes legally effective from the moment of appearance of the electronic time stamp, and therefore can be used as evidence in court. The second term which is set out in this law is a smart contract, which represent a computer program based on distributed registry technologies, the use of which is legally determined by two or more parties based on previously concluded agreements. In other words, a smart contract is a translation of an agreement or contract between two or more persons into a computer program that can certify that certain conditions are initiated and automatically executed (for example, goods are delivered after payment, a dispute settlement agreement is created and executed when the positions of both parties coincide, etc.). In addition, smart contracts are equated with the written form of a transaction, but participants in such a transaction must be identified in accordance with the procedure provided for by law. This procedure is developed by the Digital Italy Agency, which sets the appropriate technical standards. The consequences for such transactions are similar to those that occur in an electronic environment. Thus, a smart contract is considered as a method (or mechanism) for ensuring the execution of the contract (Proposta di modifica n. 8.0.3 al DDL n. 989, 2019).

Smart contracts, then, are the most promising mechanism for concluding contracts in terms of the digitalisation of this process. However, their legal status remains completely unclear, and most jurisdictions around the world still do not have specially developed regulation. Currently, the legal regulation and the practice of applying smart contracts in different countries is at the formation stage. Despite this, various legislatures in some US States (e.g., Arizona, Tennessee, Wyoming) have already enacted legislation specific to smart contracts in order to clarify that smart contracts cannot be invalidated, valid, or enforceable just because a contract is processed, executed, or otherwise applied through a smart contract – i.e., via computer code. Some European jurisdictions also explore similar legal avenues by defining the notion of a smart contract in the legislation, in particular Monaco and Italy. However, generally speaking, the fact that there is no specific regulation on such matters clearly does not mean that existing laws and general principles of law do not apply to them, or that they are not regulated at all. In the absence of specific rules, existing laws should regulate these technologies.

3.2. Judicial recognition: smart contracts and their compatibility with the requirements of contract formation

With all of the advantages of smart contracts that are enshrined in practice, classical contract law, which has formed a fully-fledged and high-quality theory of transactions, should be taken into consideration. Unique nature of smart contracts raises one of the most important questions concerning the ability of existing contract law to regulate and enforce them.

The smart contract concept creates many concerns when one tries to apply classic concepts of contract law. Moreover, such challenges have a universal nature as they cut to the core of contract law provisions, which are more or less the same regardless of jurisdiction. The main problem here lies in the fact that smart contracts are created and developed in a technical universe “parallel” to the legal realm, without a backward glance towards any legal considerations, in a way similar to the Internet in its early days (Savelyev, 2016).

To find out whether a smart contract can be considered as legally binding contract, it is necessary to establish if it meets the main requirements for the formation of a traditional contract in the common law and civil law countries. In particular, the following elements will be analysed: 1) consent through an offer and acceptance by a natural person or legal entity (similar to the “meeting of the minds” under common law); 2) the cause of the obligation (like “consideration” in the common law); and 3) the intention to create legal relations.

3.2.1. Offer and acceptance

For the emergence of rights and obligations under a smart contract, as with any other agreement, it is necessary to reach an agreement, which is expressed in the will of the parties. It is necessary to mention that the so-called offer–acceptance mechanism is the traditional method for concluding a contract in the Romano-Germanic and Anglo-Saxon legal families, but with some particularities.

Generally speaking, an offer could be described as an expression of one party to the defined provisions on condition another party will likely agree to them (Corbin, 1963/2001). The second element of a legally enforceable contract is the acceptance of the offer by the counterparty (Scholz, 2017). Acceptance according to the U.S. law means a “meeting of the minds”, where the parties have come to an agreement about the main conditions of the contract.

Properly completed acceptance of the offer determines the moment of conclusion of the contract. The agreement is considered to be concluded between the parties at the moment of reaching an agreement on all significant issues in the form required by law. Determining the moment of concluding an agreement has an important practical meaning, for the following reasons in particular:

- 1) Establishing the legal status of the parties that entered into a contractual relationship (the legal capacity of individuals and the legal personality of legal entities).
- 2) Establishing the legislation applicable to the contract (if, during the negotiations or execution of the contract, there have been changes in law).
- 3) Determining the rights and obligations of the parties, including the ownership rights received by the acquirer at the moment of the agreement conclusion in some legal systems (USA, Britain, France). There are two systems for establishing the transfer moment of ownership to the purchaser of a property: by virtue of only one agreement on the sale (USA, Britain, France), or subject to the transfer of the property (most of the EU States, including Germany). In France, the buyer’s ownership of the object being sold arises when agreement about the thing and the price is reached, despite the thing has not yet been delivered to the buyer or the price is paid to the seller. (French Civil Code, Article 1583). Likewise, in the United States, under a “sale of an individually defined product agreement”, title to the goods passes from seller to buyer at the time of the conclusion of the contract, in the absence of agreement, custom, common business practice, or intent of behaviour. If the goods are not individualised at the time of the conclusion of the contract, if they are not available, or if they are not the property of the seller, the ownership of the things passes to the purchaser after “the goods in accordance with the contract are unconditionally allocated for the performance of the contract by the seller with the consent the buyer or the buyer with the consent of the seller”. On the other hand, in the Federal Republic of Germany and other countries, where the acquisition of ownership by the buyer is associated with the transfer of a thing, the transfer of a property is often understood as its physical delivery or symbolic delivery (for example, the transfer of a key to a building)

– in other words, the “physical transfer of things” or “obtaining actual control of the thing” in the sense of para. 1 § 854 of the German Civil Code.

4) Determining the place of conclusion of the contract, which can often affect the choice of applicable law in contracts with a foreign element (Zenin, 2005).

Generally speaking, there exist two approaches to determining the time of acceptance an offer being effective. The first concept is that acceptance takes place when information about the consent to enter a contractual relationship reaches the offeror. This is the basis of the system for obtaining acceptance by the offeror. Most consistently, the system of obtaining acceptance by the offeror is carried out by German law. In accordance with § 130 of the German Civil Code, any expression of will, and therefore acceptance, becomes valid when it reaches the addressee. Accordingly, the contract under German law is considered concluded at the moment the offeror receives the acceptance, and the place of conclusion of the contract is the place of residence or location of the offeror. The second concept is the recognition that the contract is formed at the moment when the offeree sends their declaration of acceptance to the offeror. The provider takes the risk of delay or even loss of the letter of acceptance in the post office, and the contract is considered concluded at the moment of delivering the letter to the post office. Such a system is called the mailbox theory or the postal rule. This concept is very popular in common law countries. British courts affirmed the validity (effectiveness) of an emailed notice of an arbitration reference regardless of the fact that the recipient’s staff assumed the email was “spam” and ignored it (*Bernuth Lines Ltd v. High Seas Shipping Ltd*, 2005). Following this rule, not only is the offeree unable to revoke their acceptance once they have sent it, but the offeror cannot revoke their offer after an acceptance has been sent to their address. They can only revoke it if the communication of acceptance is not in the course of being transmitted to them. Therefore, in this specific case, it is the offeror and not the offeree who bears the risk of communication. This approach was traditionally favored by British courts because they perceived that the acceptance rule might result in each side waiting for confirmation of receipt of the last communication ad infinitum (Sasso, 2016). In the USA, there is also the general principle that the offeror must be notified of acceptance. In this case, it is recognised that the offeror is notified of acceptance and the contract arises at the moment when the letter containing the notice of acceptance is dropped into the mailbox. The system of sending, or the theory of the mailbox, received legislative confirmation in the United States in paragraph 26 of Article 1201 of the Uniform Commercial Code, according to which the acceptor notifies the offeror of acceptance when they take measures reasonably necessary in the ordinary course of business to notify the offeror, regardless of whether the message actually reaches the offeror.

To return to the question of smart contracts, it is necessary to mention that a smart contract fulfils the offer requirement through a posting on the blockchain ledger which occurs in an effort to elicit acceptance (Catchlove, 2017). An offer is a web page that contains a proposal to conclude a contract with a link to the program code, signed with the offeror’s private key and placed in the distributed registry. For example, a smart contract for the initial placement of digital assets – so-called tokens – may contain an offer to buy an asset for the amount provided by the state fiat currency or to exchange cryptocurrency for the proposed asset with the indication of exchange rate, payment methods, and contract execution. Thus, the web page contains the essential terms of the contract and can be considered as an offer. An offer to conclude a smart contract in the form of a web page without access restrictions may be recognised as “public” in some legal systems (for example, Germany and France), in which case it is addressed to an indefinite circle of people. In this case, any person who has performed the necessary actions for the purpose of acceptance of a smart contract will be authorised to require the offeror to fulfil the commitments of the contractual obligations. This fact should be taken into account and, if necessary, certain restrictions should be applied when accessing the web page where it is hosted.

Acceptance of a smart contract is confirmed through the act of performance of the self-executing smart contract, and must be carried out in a form similar to an offer; that is, in the form of an electronic message signed with the acceptor’s private key. The party that developed these standard terms and conditions must ensure that they are available on the website. The content of such conditions should be expressed in terms that do not allow for different interpretations and exclude ambiguity. Since the smart contract is formed in the form of an accession agreement, the acceptance of the smart contract cannot change its program code or, consequently, its terms. As such, there is no possibility of a counteroffer. Therefore, the ultimatum principle formulated in British law applies: take it or leave it.

In addition, offer and acceptance in a smart contract could be also expressed in the following forms: 1) in a written contract that the parties conclude at the entrance to the blockchain and in which they negotiate, in particular, the terms of future smart contracts or the procedure for determining them – in this case, this can be applied to the design of the framework contract; and 2) in the form of click-wrap agreements, the terms of which are set out in electronic form whereby acceptance is offered by clicking the *I agree* box. Considering these explanations, in most cases, the offer to accept the terms of click-wrap agreements corresponds to the characteristics of a public offer. Acceptance in this case is expressed by performing specific actions (Savelyev, 2017).

Essentially, the initial stage of a contractual agreement is not very different between smart contracts and traditional contracts because before any contract can operate, two parties must agree to some set of contractual terms (Raskin, 2017). Meanwhile, the moment of signing a smart contract is very important from the perspective of determining the time of acquisition of rights and obligations by parties. The determination of the moment of conclusion of the smart contract differs between the approach that exists in the continental legal system family (the time of receipt of acceptance by the offeror), and that of Anglo-Saxon law (the moment when the acceptance was sent, i.e., the mailbox theory). From the perspective of this paper, the moment of conclusion of a smart contract can be clearly defined, since the software of the code is activated only at the time of making a corresponding entry about the acceptance of the offer in the next block of distributed registry entries.

In the field of smart contracts an acute question is related to the possibility of reaching a “meeting of the minds”, when one part of the contracting process is completed without human involvement. Meanwhile, the answer to this question may be positive taking into account legal principles contained in the Electronic Signatures in Global and National Commerce Act (hereinafter the ESIGN Act) and the Uniform Electronic Transactions Act (hereinafter UETA). According to them, the actions of the electronic agent (software) are equal to the actions of natural person or legal entity. Hence, if both parties read and understand the terms written in computer code, which is also verifiable by a third-party adjudicator (courts or arbitral tribunals through the use of experts to distil the meaning of the computer code), then there is nothing preventing that meeting of the minds from being enforced and valid (Kaulartz & Heckmann, 2016).

3.2.2. Consideration and the cause

In the Anglo-Saxon legal family, ideas about contract formation are in some sense different in comparison with Roman law. In particular, the American researcher Christopher Octave (2004) points out that in common law a contract is considered as a promise, confirmed by a counter-provision, whereas, in the Roman legal tradition, a contract is an agreement.

The proponents of the doctrine of *causa* associate it with the Roman law. Thus, article 1131 of the French Civil Code stipulated that “an obligation without ‘cause’ or founded on a wrong ‘cause’ or an illicit ‘cause’ can have no effect”. Indeed, *causa* in the Roman law means any basis for the actions (Lorenzen, 1919).

According to German approach, “every lawful agreement entered into with the serious intention of being legally binding would directly produce of its own force obligatory effect, without regard to the form in which it was expressed” (Lorenzen, 1919). Domat stated that it is necessary to distinguish between bilateral, real, and gratuitous contracts. The *causa* of the obligation of each party in a bilateral contract consisted in the obligation assumed by the other. In the case of a real contract, the executed consideration should be regarded as the cause; in case of donations - the purpose for which the gift was presented (Lorenzen, 1919). Broadly speaking, the *causa* defines the real actions of the participants and the reasons for concluding an agreement.

On the other hand, to be a legally binding contract under common law, the parties should exchange their promises. It is said sometimes that *causa* originates from the English doctrine of consideration. As Simpson (1975) observed, treatise writers in the early 19th century considered consideration as a version of the doctrine of *causa*.

The doctrine of consideration is one of the most fiercely debated aspects of contract law in common law jurisdictions. Consideration emerged during the sixteenth century as an element of actions in *assumpsit* (breach of promise or undertaking) (Ricks, 2000) – despite its controversial status, however, it remains an essential requirement for the formation of contracts not in deed form.

Consideration is a fundamental prerequisite in English contract law, according to which a promise will not be enforceable unless it is supported by consideration. The main characteristics of the concept of consideration are the following: 1) consideration should include real benefit to the promisor; 2) adequacy of consideration is not required (Lorenzen, 1919). English courts do not question the adequacy of consideration, but there must be some exchange of value. In other words, the “exchange” need not be of equivalents. “A Court is concerned only with the presence of consideration and does not make an assessment of the comparative value of the acts or promises of the parties towards one another” – nominal consideration is sufficient (*Melmerley Investments Ltd v. McGarry*, 2001). According to Gordley (1995), American courts connect the doctrines of consideration with the consequences of the contract on the wealth of the parties.

In relation to smart contracts, it is interesting to note that the consideration for such contracts is in performance (*Carlill v. Carbolic Smoke Ball Co Ltd*, 1892). The consideration requirement is satisfied by smart contracts since they, by definition, entail an exchange of digital assets. Therefore, sufficient consideration will normally be both conceptually and pragmatically present in smart contracts in order to render them legally enforceable.

3.2.3. The intention to create legal relations

The requirement of “the intention to create legal relations” is one of the most important terms of a valid contract in the common law countries. English law specifically requires the existence of the “intention to create legally binding contract” for enforcing a contract, despite the existence of “consideration” for the contract (Gulati, 2011).

According to the legal literature, a declaration of intent leading to the conclusion of a contract can be expressed by the parties through the exchange of assets or services with one another. A similar transaction-based interpretation has also been outlined in regard to smart contracts (Koulu, 2016). A declaration of intent by acting upon it can, for instance, take place in the purchase of items from a vending machine. In this case, the proprietor selling items and services via the vending machine has implicitly displayed its desire to conclude a contract with the terms specified by the vending machine. This is supported, for example, by the fact that the proprietor has first had to obtain the vending machine and a location for it, set up the vending machine, fill it with products, program the vending machine, and make it operational before any contracts can be concluded. The user also expresses their will to be bound to the transaction similarly via the vending machine (Saarnilehto, Hemmo, & Kartio, 2012).

Expressions of intent when entering a smart contract have many similarities with a tacit agreement, when a contract is entered by parties exchanging assets. When one party transfers an amount to a smart contract and the other party begins to act based on a smart contract, expressions of the intentions of both parties are included in the actions taken. Although there is no intentional expression, action by the other party is necessary in order to be bound by the contract. Here, the “creator” of the smart contract announces their desire to conclude contracts by building a smart contract on the blockchain and transferring certain assets to it. The other party to the smart contract expresses its will by acting in accordance with the terms of the contract, therefore accepting the offer. Finally, when the preconditions specified in the smart contract are met, it performs itself automatically.

Hence, it is almost certain that the intention to create legal relations will be found in most smart contracts (Durovic & Janssen, 2019). Moreover, “consideration” should be indicative of such an intention. Therefore, as far as common law countries are concerned, there should not be any separate requirement of proving an “intention to create legal relation”. Declaration of intent is an immovable part of a smart contract, and is closely connected with the execution of a contract.

Therefore, even though smart contracts fulfil the requirements for the formation of contracts, there exist different understandings of the incorporation of smart contracts into the law. This fact, in turn, can pose a challenge to cooperation between countries.

The corollary of this is the necessity of a special legal structure emerging: so-called *crypto-legal structures*. Crypto-legal structures are the result of implementing legislation through smart-contracting, semi-autonomous, cryptographic computer code. Firstly, law is created through legislation or regulation written in words, and is then implemented through computer code. Due to the direct interaction of the crypto-legal structure, new legal

principles and issues could occur. This will give rise to new substantive legal issues and cause shifts in legal culture and legal structures (Reyes, 2017). In other words, the emergence of cryptolaw has the potential to disrupt the fundamental difference between legal structures. By translating statutes and regulations into cryptographic, smart-contracting computer code to create crypto-legal structures, the gap between the importance of computer codes in common and civil law jurisdictions will narrow.

New legal principles that would be implemented through computer code represent a method of the harmonisation of common and civil law. Most of these differences can be transcended, as they pertain to specific rules rather than deeply ingrained principles and legal cultures. It is the position of this paper that the following rules should be incorporated in order to provide a unanimous approach to smart contracts:

- 1) The civil law approach to the principle of good faith should be used, in light of which the issuer shall be bound to fulfil the performance in accordance with the requirements of good faith. This means that all the main conditions of the smart contract should be disclosed, so that any participant can clearly understand them before entering the contract.
- 2) The civil law approach to such principles of law as “freedom of contract” should be used. Given the need to protect a weak party in an obligation, one should understand the applicability of consumer protection legislation to smart contracts. It is necessary to provide the responsibility of a professional entity (sellers, persons providing services, and other persons) for introducing into the program code rules which violate consumer rights. Such a responsibility should arise from a professional subject even in the absence of their fault.
- 3) The definition of the moment of conclusion of a smart contract should differ both from the approach existing in civil law (the moment of receipt of the acceptance by the offeror) and from the approach of Anglo-Saxon law (the moment of sending the acceptance, that is, the mailbox theory). The moment of conclusion of a smart contract should be clearly defined, since the program code is activated only at the time of making a corresponding entry on the acceptance of the offer in the next block of entries in the distributed registry. Moreover, it should be provided that offers are freely revocable within a fixed time, after the expiration of which the offer becomes irrevocable. The validity period of the offer must be recorded on the web page. Acceptance of a smart contract must be expressed in the form of an electronic message signed with the acceptor’s private key.

To summarise these provisions, the implications of crypto-legal structures could decrease the gap between different legal systems. Meanwhile, being an extreme form of code as law, crypto legal structures could enable organisations to effectively comply with encoded rules and to ensure that parties make appropriate transactions.

Conclusion

Scholars and legislators have not yet developed a unified approach to the definition of a smart contract and its legal nature. This is due to the fact that the smart contract is a new phenomenon. However, the use of smart contracts is expanding every year due to a number of advantages based on the use of blockchain. These advantages, which are provided by the characteristics of this technology, include: the impossibility of unilaterally changing terms; self-enforcement; synchronisation and encryption of information; and the simultaneous availability of information to all participants in the transaction. The main positions regarding the legal nature of a smart contract are: recognition of its program functioning on the basis of a distributed, decentralised registry; and an electronic contract, or method of contract execution. Such contradictions in the understanding of a smart contract and its legal nature complicate its application. In forging this connection, the author formulated a definition of the smart contract as a new way to fulfil obligations entered into, in the form of software code.

This research has shown that the experience of the legislative regulation of smart contracts in the EU and the USA is different. In most countries, there is no legal regulation of smart contracts. However, Monaco, Italy, and some US states (Arizona, Tennessee, and Wyoming) have definitions of a smart contract at the legislative level.

Meanwhile, in the absence of specific regulation on smart contracts, existing rules and law principles should be applied to them. Thus, by interpreting smart contracts through traditional contract law doctrine, it can be stated that smart contracts integrate all of the elements of a contract (offer, acceptance, consideration (*causa*), and intention to create legal relations). For this reason, a smart contract should be legally binding in the common and civil law countries. However, the differences in the domestic legal systems on certain fundamental issues – such as the binding nature of offers, good faith, freedom of contract, and moment of conclusion of contract – gave rise to intense discussions on these differences and their importance regarding their application to smart contracts.

As a way of reaching a uniform approach between these differences, this paper suggests creating crypto-legal structures, implementing the legal rules of both legal systems through computer code. These rules should represent a compromise between the USA and EU approaches, as representatives of different legal traditions, to interpreting smart contracts through traditional contract law doctrine. This could contribute to the bridging of the gap, providing a uniform understanding and global regulation of smart contracts.

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