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DISPUTE RESOLUTION MECHANISM FOR SMART CONTRACTS

by

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Disputes regarding smart contracts are inevitable, and parties will need means for dealing with smart contract issues. This article highlights the need for dispute resolution mechanisms for smart contracts. The author provides analysis of the possible mechanisms to solve disputes arising from smart contracts, namely dispute resolution by traditional arbitration institutions and blockchain arbitration. Article acknowledges the benefits and challenges of both mechanisms. In the light of this, the author concludes about instituting a hybrid approach aimed at resolving disputes that will not stymie efficiencies of smart contracts.

KEY WORDS

1. INTRODUCTION

With the rapid development of new technologies occurring during the fourth industrial revolution, new types of disputes with significant specifics are gradually beginning to form. A special category among them belongs to disputes arising from smart contracts based on blockchain technology. Smart contracts are not really "contracts" in the true sense of the word, understood by most as negotiated terms in an arms-length transaction (or "meeting of the minds").[1] Enforcement is automatic, and the code is immutable. Therefore, smart contracts on the blockchain

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[1]   Schmitz, A. J. and Rule, C. (2019) Online Dispute Resolution for Smart Contracts. *Journal of Dispute Resolution. University of Missouri School of Law Legal Studies Research Paper,* 2019 (11). Available from: https://ssrn.com/abstract=3410450 [Accessed 12 April 2022].

present a different set of challenges due to the inflexibility of the code-based executions.

It has to be noted that there is a close interaction between the real world and the software transaction world. Smart contracts inherently interfere with real-world people or institutions, which would result in legal issues due to the nature of our societies.[2] For the reason that virtual experiences lead to specific actions in the real world, disputes are inevitable. Possible scenarios in which disputes may arise include changing of circumstances, creating undesirable results for one party, absence of legal capacity to enter into the smart contract. Smart contracts may not be accurately coded to encompass the parties' original intentions. Moreover, coders may be sued for liability as a result of inaccurate smart contracts, or hackers may be prosecuted for interfering with or manipulating smart contracts.[3] In this respect, the potential need for dispute resolution mechanism is inevitable. But nowadays, there exist no well-defined system of rules applicable to smart contracts. All these aspects show that there is room for identifying dispute resolution mechanisms for smart contracts.

Generally speaking, there are two possible ways to resolve such disputes. According to the first approach, they are subject to review by traditional courts. The second approach assumes that arbitration institutions lend to resolve disputes arising out of smart contracts. They, in turn, are divided into two groups:

a) "off-chain" arbitration, meaning dispute resolution by traditional arbitration institutions guided by the usual rules;

b) "on-chain" arbitration that assumes to create innovative applications based on blockchain technology and designed to resolve disputes arising in a digital decentralized environment (blockchain arbitration).[4]

My focus in this article is on the possible mechanisms to solve disputes arising from smart contracts. I have two aims: first, to outline a framework for dispute resolution by traditional arbitration institutions and blockchain arbitration, and second, based on advantages and disadvantages of both

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2   Clément, M. (2019) Smart Contracts and the Courts. In: DiMatteo, L., Cannarsa, M. and Poncibò, C. (eds.) The *Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms.* Cambridge University Press, pp. 271–287.

3   Zaslowsky, D. (2018) *What to Expect When Litigating Smart Contract Disputes.* [online] Available from: https://www.law360.com/articles/1028009/what-to-expect-when-litigating-smart-contract-disputes [Accessed 02 May 2022].

4   International Chamber of Commerce (2018). *ICC Dispute Resolution Bulletin. Issue 1.* Available from: https://www.hoganlovells.com/~/media/hogan-lovells/pdf/2018/2018_12_13_icc_robots_arbitrator.pdf [Accessed 02 May 2022].

mechanisms I introduce a new hybrid approach to blockchain dispute resolution, that combines both on and off-blockchain components.

2. ANALYSIS OF THE POSSIBLE DISPUTE RESOLUTION MECHANISMS

The first question while considering dispute resolution mechanisms should be asked whether traditional courts could adjudicate disputes arising from smart contracts. In this respect, the following should be mentioned. Firstly, a smart contract is the code, which is understandable to programmers, not lawyers and judges. Courts may be substantially challenged in interpreting smart contracts, written in a coded language, that is not understandable to a human observer. Furthermore, a court could not intervene to prevent or reverse an automatic contract, since the execution of smart contracts does not allow for modifications.[5] As James Grimmelmann notes,

> *"…as long as the code does what it is supposed to and blockchain nodes achieve consensus, the intent and actions of one's counterpart do not matter; once triggered, the contract moves forward as defined at the time of its writing, regardless of either party's change in circumstances, misunderstandings, or otherwise."[6]*

In this regard, it is important to distinguish between two main models of smart contracts: external and internal.[7] External smart contracts are those that are governed by traditional, natural language contracts with the smart, code-driven part of the contract merely automating the performance of terms as appropriate (e.g. payment, shipment, etc.). If there is any disagreement between the parties, the traditional, non-code version of the contract prevails. An external smart contract must be clear about which version of the contract prevails in order to successfully put the natural-language terms first and foremost. However, when such clarity is lacking in multi-language contracts, the UNIDROIT Principles stipulate

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[5] Rodrigues, U. (2018) Law and the Blockchain. *Iowa Law Review,* 104. Available from: https://ilr.law.uiowa.edu/print/volume-104-issue-2/law-and-the-blockchain/ [Accessed 02 May 2022].

[6] Grimmelmann, J. (2019) All Smart Contracts are Ambiguous. *Journal of Law & Innovation,* 2 (1). Available from: https://www.law.upenn.edu/live/files/9782-grimmelmann-all-smart-contracts-are-ambiguous [Accessed 02 May 2022].

[7] Chamber of Digital Commerce. (2018) *Smart Contracts: Is the Law Ready?* Available from: https://www.theblockchaintest.com/uploads/resources/CDC%20-%20Smart%20Contract-Is %20the%20Law%20Ready%20-%202018%20-%20Sep.pdf [Accessed 02 May 2022].

that preference should be given to the contract that was originally drawn up. Presumably, the same can apply to smart contracts; if the code was written first and the natural-language contract second, the code prevails. Inversely, one may say that code is not a "human" language of any kind and therefore should be interpreted as an appendix for the natural language contract, but not the main, binding part of any agreement. This approach may work in certain contexts, however, given that the code creates an outcome automatically, its interpretive value seems more relevant to the main body of most external smart contract.[8]

In the internal smart contracts, the code is supreme and any natural--language portion of the agreement is secondary. Therefore, while the natural-language portion of the contract may help courts understand the parties' intent, they will still have to interpret code to understand what consensus was reached. While this has been raised as a problem for courts wishing to exert power over smart contracts, the use of expert witnesses who can read and inform the court what the code "says", can quickly and easily remedy this issue (e.g. bringing a programmer to the stand to testify what the outcome of the code, as written, would be).[9] Thus, regardless of the specific type of smart contract, the inflexibility of code-based executions presents potential challenges.

Secondly, the anonymous nature of smart contracts and the fluidity of online identities make it difficult to determine the identities of the parties. The aforementioned anonymity gained by the use of public-key encrypted identities and VPNs. Nodes that contain the blockchain and all of its information are located all over the world. Transactions in the blockchain are fully networked and present only in cyberspace. The nodes hold imperfect partial copies of the blockchain; no particular node holds the entire blockchain.[10] And the decentralized nature of smart contracts prevents courts from establishing jurisdiction and determining the choice of law based on traditional rules.

For all of these reasons, it can be concluded that smart contract disputes should not be resolved by any national court. This leads to the demand for

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[8]   Sillanpaa, T. (2020) Freedom to (Smart) Contract: The Myth of Code and Blockchain Governance Law. *IALS Student Law Review,* 7 (2). Available from: https://journals.sas.ac.uk/lawreview/issue/view/582 [Accessed 02 May 2022].

[9]   Ibid.

[10] Kaal, W. A. and Calcaterra, C. (2018) Crypto Transaction Dispute Resolution. *Business Lawyer.* Available from: http://dx.doi.org/10.2139/ssrn.2992962 [Accessed 05 May 2022].

resolving smart contract disputes with cross-jurisdictional, extra-legal, and efficient remedies.

Therefore, international arbitration presents a well-suited alternative for smart contract disputes as they have many common features, such as functioning in a decentralized manner, flexibility, confidentiality of proceedings. Nowadays, there exist two main approaches for dealing with smart contract issues, namely "on-chain" and "off-chain" arbitration.[11]

2.1 "OFF-CHAIN" ARBITRATION (DISPUTE RESOLUTION BY TRADITIONAL ARBITRATION INSTITUTIONS)

According to this approach, smart contracts can operate within the existing contract law framework, and disputes arising from them are subject to the arbitration institutions.[12] In this regard, a special arbitration center dealing with the resolution of digital disputes is being created or a specialized board in the existing arbitration institutions is being formed. Generally speaking, "off-chain" dispute resolution system could be characterized as a combination of traditional forms of dispute resolution process, lacking a mechanism for the automatic enforcement of the award.

For instance, on the 8th of November 2018 was opened the *Court of Arbitration of the Polish Blockchain and New Technology Chamber of Commerce* (hereinafter "Court of Arbitration") which purpose is to resolve disputes related to digital technologies.[13] It is Europe's first and the world's second (after Japan) arbitral tribunal specializing in blockchain. Court of Arbitration applies the provisions of the Rules of the Court of Arbitration of the Polish Blockchain and New Technology Chamber of Commerce (hereinafter "Rules").[14] According to paragraph 3 of the Rules, the Court of Arbitration has jurisdiction over a dispute if the parties conclude a written agreement (arbitration agreement) in the following forms:

[11] Szczudlik, K. (2019) *"On-chain" and "off-chain" arbitration: Using smart contracts to amicably resolve disputes.* [online] Available from: https://newtech.law/en/on-chain-and-off-chain-arbitration-using-smart-contracts-to-amicably-resolve-disputes [Accessed 02 May 2022].

[12] De Filippi, P. and Wright A. (2018) *Blockchain and the Law: The Rule of Code.* Cambridge, Cambridge, MA: Harvard University Press, 300; Holden R. and Malani A. (2018) Can Blockchain Solve the Holdup Problem in Contracts? *University of Chicago Coase-Sandor Institute for Law & Economics. Working Paper,* 846.

[13] *The Court of Arbitration of the Polish Blockchain and New Technology Chamber of Commerce.* [online] Available from: https:// blockchaincourt.org/ [Accessed 02 May 2022].

[14] The Court of Arbitration of the Polish Blockchain and New Technology Chamber of Commerce (2019). The *Rules of the Court of Arbitration of the Polish Blockchain and New Technology Chamber of Commerce.* Available from: https://blockchaincourt.org/wp-content/uploads/2019/07/The-Rules-of-the-Court-of-Arbitration-ENG.pdf [Accessed 04 May 2022].

a) a clause included in letters exchanged between the parties or declarations made by the parties by means of remote communication that enable the content of such declarations to be recorded

b) a reference made in a written agreement to a document containing a provision on submitting disputes to resolution by the Court of Arbitration. The dispute resolution process is carried out according to the standard arbitration procedure with certain exceptions. Firstly, the number of arbitrators for resolution of the dispute could be 5 or 7 in contrast to "traditional" arbitration (paragraph 19 of the Rules), where the number of arbitrators is limited (1 or 3). Secondly, an award made by the Court of Arbitration shall be pronounced at the same hearing at which the trial is closed. When pronouncing the award, the presiding arbitrator shall state orally the main reasons upon which such award is based (paragraph 45 of the Rules).   Whereas the traditional arbitration ends without the announcement of the decision, which is sent to the parties later.

This approach also includes the creation of specialized boards in the existing arbitration institutions. For example, in 2018, the *Arbitration center of the Russian Union of Industrialists and Entrepreneurs (RSPP)* announced the formation of a new *Panel on disputes in the digital economy.* The panel was created to resolve disputes arising from transactions involving automatic execution, including using information systems based on a distributed registry (blockchain); disputes arising from the issuance, accounting and circulation of digital rights and disputes over transactions made using and (or) in relation to digital financial assets.[15] Due to the absence of special rules, the proceedings on such disputes are conducted according to the Rules of the arbitration center at the RSPP 2018.[16]

The above-mentioned approach to the disputes arising from smart contracts is considered the mainstream view. Although in the legal literature it is often criticized.[17] Instead, it is proposed to create special methods of dispute resolution based on technology- blockchain arbitration.

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[15] *Arbitraznyu zentr pri RSPP.* [online] Available from: https://arbitration-rspp.ru/about/structure/boards/digital-disputes/ [Accessed 04 May 2022].

[16] Ibid.

[17] Schmitz, A. and Rule C. (2019) Online Dispute Resolution for Smart Contracts. *Journal of Dispute Resolution,* 2, pp. 103–125.

2.2 "ON-CHAIN" ARBITRATION (BLOCKCHAIN ARBITRATION)

This group includes projects that provide for the creation of new mechanisms specifically designed to resolve disputes arising from smart contracts. "On-chain" arbitration contains solutions in which the equivalent of a traditional arbitration decision is automatically executed by a smart contract without the involvement of any third parties. For instance, this could be realized with the help of certain assets, which, upon the occurrence of a defined condition, are transferred from one party to the other.[18]

This approach contemplates smart contracts as distinct legal tools, rather than digital alternatives to traditional legal contracts. From this perspective, blockchain technologies and smart contracts may create new legal systems, or a new *Lex Cryptographia*.[19] Several characteristics of blockchain-based technologies and smart contracts, such as its anonymity, automatic execution, and tamper-resistance, mean that

"existing legal infrastructure cannot address legal challenges presented by crypto transaction disputes".[20]

Instead, these disputes require a "distributed jurisdiction" created through a process of institutional innovations.

Currently, there exist more than 20 projects that use blockchain to automate dispute resolution. All these projects could be divided into two groups:

a) Special on-line arbitration (CodeLegit, Cryptonomica, Juris, Mattereum, SAMBA);

b) Crowdsourced dispute resolution (Aragon, BitCad, CrowdJury, Confideal, Jur, Kleros, Oath).

In this article, I examined the most noteworthy projects, which have already been tested by end users.

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[18] Szczudlik, K. (2019) *"On-chain" and "off-chain" arbitration: Using smart contracts to amicably resolve disputes.* [online] Available from: https://newtech.law/en/on-chain-and-off-chain-arbitration-using-smart-contracts-to-amicably-resolve disputes [Accessed 02 May 2022].

[19] De Filippi, P. and Wright A. (2018) *Blockchain and the Law: The Rule of Code.* Cambridge, Cambridge, MA: Harvard University Press, 300.

[20] Kaal, W. A. and Calcaterra, C. (2018) Crypto Transaction Dispute Resolution. *Business Lawyer.* Available from: http://dx.doi.org/10.2139/ssrn.2992962 [Accessed 05 May 2022].

2.2.1 SPECIAL ON-LINE ARBITRATION

This group includes platforms that enable the creation of a special arbitration combining the advantages of international commercial arbitration and blockchain technology. They presume the automation of certain elements of the proceedings. However, the mechanism of their action is in many ways similar to international arbitration, as the rules of many such projects are based on the UNCITRAL Arbitration Rules. In this case, the decision made by the arbitrators is executed in the traditional way or is automatically executed with a smart contract.

For instance, a *Juris project* that presents a blockchain-based development system, operating on the basis of the Juris Protocol Mediation and Arbitration.[21] A prerequisite for considering a dispute is the existence of an arbitration agreement, integrated into a smart contract via a coded clause. In case of a dispute between the parties, a user initiates a protocol by filing a complaint (Formal Complaint). The system suspends further execution of the smart contract generation and notifies the other party about the dispute. After that, the following three procedures are possible:

1) Self Mediation – through which the parties get access to a number of tools, specially designed for self-regulation dispute resolution with the help of Self-Enforced Library Functions (or Self layer). These tools enable the execution of basic operations that alter the outcome of a smart contract implementation (such as contract cancellation and asset transfer). In the case of impossibility to resolve the dispute, parties could escalate to the second stage.

2) SNAP (Simple Neutral Arbitrator Poll) means the consideration of the dispute by independent arbitrators. Results of the voting are reported to the parties. Based on this information, the parties still may try to resolve the dispute by using Self layer or applying to the third tool.

3) PANEL (Juris Peremptory Agreement for Neutral Expert Litigation) is the analogue of traditional arbitration proceedings based on the UNCITRAL Arbitration Rules. The dispute is reviewed by three arbitrators selected on the basis of their reputation and compliance with the requirements specified by the parties while entering into the contract.

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[21] Kerpelman, A. J. (2018) *Introducing the Juris Protocol: Human-Powered Dispute Resolution for Blockchain Smart Contracts.* [online] Available from: https://medium.com/jurisproject/introducing-the-juris-protocol-human-powered-dispute-resolution-for-blockchain-smart-contracts-bc574b50d8e1 [Accessed 05 May 2022].

After hearing the parties and considering evidence, the arbitrators within 30 days make a decision that is binding and subject to automatic execution by smart contract.

Another project based on the blockchain technology is *Mattereum*, which presents the layer of the legal, technological, and commercial infrastructure that governs on-chain rights control and transfer for tangible, intangible, and digital assets. Mattereum supports a decentralized commercial law system, the Smart Property Register, that executes through automated smart contracts that ensure property rights, as well as dispute resolution and enforcement. This register facilitates "on-chain property transfer" through a smart contract that in effect becomes a "legal contract" without the need for legislative support.[22] A distinctive feature of this project is the "Ricardian Contracts" on which the contract protocol is based.[23] Ricardian Contracts are cryptographically verified documents signed with a digital signature and available for reading both in electronic and text form. The project involves the creation of a decentralized arbitration court, meeting the requirements of the New York Convention on Recognition and Enforcement of Foreign Arbitral Awards of 1958 (hereinafter referred to as the New York Convention). Therefore, awards of such decentralized commercial arbitration court will be enforced by national courts in nearly all of the countries in the world.[24]

A separate point must be made about *OpenBazaar Dispute Resolution (notary)*. It is a distributed program that provides an on-line trading platform for any type of merchandise using cryptocurrencies.[25] It is a distributed network where the parties and transactions are anonymous.[26] A core element of the OpenBazaar dispute resolution mechanism concerns the possibility of appealing to a notary who becomes an arbitrator and determines the dispute based on the evidence presented. Notaries in the OpenBazaar system are randomly chosen to provide anonymity for keeping the system secure. An important feature of OpenBazaar's approach

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[22] Allen, D., Lane, A. M. and Poblet, M. (2019) The Governance of Blockchain Dispute Resolution. *Harvard Negotiation Law Review*, 25, pp. 75–101.

[23] Zagaynova, M. (2018) *Obzor ICO proekta Mattereum.* [online] Available from: https://ffc.media/ru/overviews/ico-mattereum-project-review/ [Accessed 21 June 2022].

[24] Allen, D., Lane, A. M. and Poblet, M. (2019) The Governance of Blockchain Dispute Resolution. *Harvard Negotiation Law Review*, 25, pp. 75–101.

[25] Sanchez Dr W. *Dispute Resolution in OpenBazaar.* [online] Available from: http://docs.openbazaar.org/03.-OpenBazaar-Protocol/ [Accessed 21 June 2022].

[26] Kaal, W. A. and Calcaterra, C. (2018) Crypto Transaction Dispute Resolution. *Business Lawyer.* Available from: http://dx.doi.org/10.2139/ssrn.2992962 [Accessed 05 May 2022].

is connected with the ability of the parties to choose the notary pools as an expert in certain fields of law. Besides, OpenBazaar has an appeal system that includes randomly selecting new notaries from the pool chosen by the parties earlier.

2.2.2 CROWDSOURCED DISPUTE RESOLUTION

This group includes projects that provide for the establishment of fundamentally new, unique platforms based on blockchain technology and specifically designed to resolve disputes arising from smart contracts. Their essence is an attempt to create a quasi-judicial system, where the judges (members of the jury) are registered on the relevant platform users who are elected through the method of generating random numbers, remaining anonymous to the parties. Each of the judges votes separately; after the voting is completed, the system counts the votes and determines the outcome of the dispute. Then the decision is automatically executed using a smart contract. Another important characteristic of such projects is the use of codes of non-state regulation in the dispute resolution process.[27]

It has to be noted that crowdsourced dispute resolution is not new. For example, more than twenty years ago iCourthouse pioneered the notion of online crowdsourcing in civil cases and ten years ago eBay India's Community Court leveraged the best judgement of other eBay users to decide whether a contested eBay review should be deleted. The following examples of crowdsourced dispute resolution on the blockchain go even further with this model, however, by tokenizing the process. In other words, jurors vote with funds (generally cryptocurrency), which they lose if they are on the losing side. In contrast, jurors on the winning side generally gain some reward. This creates a market for accurate crowdsourced resolution outcomes.[28]

One example is *Oath*, a project based on the Ethereum platform. The model of OATH's dispute resolution is related to the idea of a jury trial. When entering into a smart contract, the parties can use the provided dispute resolution protocol (Smart Arbitration Plan). In the case of a dispute, the protocol is converted into a Smart Arbitration Case. After

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[27] Zasemkova O. (2020) Methods of Resolving Disputes Arising from Smart Contracts. *Lex Russica*, 73 (4), p. 20.

[28] Rule, C. and Nagarajan, C. (2011) Crowdsourcing Dispute Resolution Over Mobile Devices. In: Poblet, M. (ed.) *Mobile Technologies for Conflict Management. Law, Governance and Technology Series, vol 2.* Dordrecht: Springer, pp. 93–100.

that, the parties set the parameters for resolving dispute: the number of jurors (any odd number in the range from 11 to 101); the percentage of votes required to make a decision (from 51 to 100 %). Juries are selected randomly from the users of the blockchain platform. The decision is made solely on the basis of common sense (Common sense), based on the study of the terms of the contract, witness statements and other evidence. The decision can be appealed within 5 days from the date of its issuance by repeating the procedure but with other jurors.[29]

Like Oath, *Kleros* promises inexpensive and transparent, online dispute resolution using crowdsourcing theory. The mechanism is similar to Oath, advocating for an opt-in court platform that uses "crowdsourced jurors". First, smart contracts have to designate Kleros as their arbitrator in cases of dispute, including the type of court (Kleros is developing an ecosystem of specialized courts) and the number of juries to be involved (idem). When a dispute arises, Kleros randomly assigns the dispute to a jury of crowdsourced, self-selected experts, who analyze the evidence and vote for a verdict. Jurors are penalized for communicating with each other, and must "justify" their votes so that the parties can later understand their decisions. A smart contract then transfers the money to the winning party. Oracles are engaged to provide real-world data to assist dispute resolution.[30]

A similar platform is *Jur.io* that advertises itself as a free service to users for creating and securing smart contracts and resolving contract disputes within 24 hours. Accordingly, Jur's key promise seems to be speed and security in smart contracting.[31] Its unique feature is the opportunity to create their own hub (a "specialized oracle") which operates on special rules for users in particular industries.[32] Additionally, the Jur platform provides tools for signing contracts, and creating and reselling contract templates.[33]

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[29] *OATH Protocol. Blockchain Alternative Dispute Resolution Protocol. Version 2.6.0.* Available from: https://oaths.io/files/OATH-Whitepaper-EN.pdf [Accessed 15 June 2022].

[30] Allen, D., Lane, A. M. and Poblet, M. (2019) The Governance of Blockchain Dispute Resolution. *Harvard Negotiation Law Review*, 25, pp. 75–101.

[31] *JUR.Io – platforma kotoray pomozet razreshit finansovye spory mezdy investorami i srartupami.* (2018) [online] Available from: https://invest4all.ru/obzory-i-otchyoty/obzory-kraudsejlov-ico/jur-io-platforma-kotoraya-pomozhet-razreshit-finansovye-spory-mezhdu-investorami-i-startapami [Accessed 15 June 2022].

[32] Ibid.

[33] Ibid.

It is worth pointing out that the above-mentioned platforms have a dispute resolution mechanism with the following characteristics: (i) adjudicator expertise in dispute resolution and law; (ii) independence (neutral and anonymous adjudicators); (iii) impartiality (random selection of judges without vested interests); and (iv) transparency (all procedures are documented and rationalized).[34]

3. SHORTCOMINGS OF THE TRADITIONAL ARBITRATION INSTITUTIONS AND BLOCKCHAIN ARBITRATION

There are several drawbacks associated with "off-chain" arbitration. Firstly, courts could only force the parties to execute a secondary transaction or otherwise pay remedies for a smart contract that created damages for one of the parties. Courts are not able to change the terms of the given smart contract that was executed according to its parameters and added to the blockchain because they could not change the existing code. Because of these inherent limitations, courts are not able to render resolutions to disputes arising from blockchain-based smart contracts. Secondly, it is worth mentioning that high price is another disadvantage of traditional arbitration institutions. In particular, Tang Z. S. states that the average online consumer contract value is USD60, whereas an exemplary UK provider of ODR services charges between GBP25 and GBP850 for a resolution of consumer disputes. Therefore, even the lowest charge of GBP25 will be disproportionately expensive compared with the average value of the consumer disputes.[35]

Moreover, traditional arbitration institutions are characterized by a slow speed of dispute resolution. However, in the online environment, people would often like to get a quick decision. In relation to the incapability of traditional dispute resolution to resolve numerous online disputes, it should be pointed out that when the number of disputes runs into the millions, human-powered dispute resolution cannot handle the scale of disputes.[36]

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[34] Allen, D., Lane, A. M. and Poblet, M. (2019) The Governance of Blockchain Dispute Resolution. *Harvard Negotiation Law Review*, 25, pp. 75–101.

[35] Tang, Z. S. (2015) *Electronic consumer contracts in the conflict of laws.* 2nd ed. Oxford: Hart Publishing, p. 373.

[36] Dimov, D. (2017) *Crowdsourced Online Dispute Resolution.* [online] Ph.D. Leiden University.

Therefore, traditional arbitration mechanisms could not be the only possible recourse for smart contract disputes.[37]

The first drawback of "on chain" arbitration concerns the enforceability of awards. In other words, arbitral awards rendered through online arbitration may not be recognized and enforced under the New York Convention because, pursuant to Article 2 of the New York Convention, it applies only to agreements "in writing".[38] However, online arbitral agreements would appear to satisfy the writing requirements of the convention. The reason is that, under most national legislation, electronic writings are considered equivalent to traditional writings.[39] As a corollary, it is uncertain whether an award issued pursuant to an arbitration agreement contained in the code of a smart contract would be capable of being enforced.

The second drawback is the lack of trust in the procedures caused by non-face-to-face communication. People who do not trust each other may act tentatively and keep important information to themselves. As a result, disputants participating in ODR processes may not disclose all the relevant information to online arbitrators.[40] Moreover, criminals may exploit the information security vulnerabilities of the ODR platform in order to obtain unauthorized access to information related to the dispute and the disputants. That is why the ODR provider should use information security practices.[41]

The third drawback concerns the parties who may not be familiar and comfortable with the relevant technology. Besides, it should be noted that the legal qualification of arbitrators may be crucial for parties who want to choose arbitrators with the special technical knowledge to adjudicate certain disputes.

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[37]   Kaal, W. A. and Calcaterra, C. (2018) Crypto Transaction Dispute Resolution. *Business Lawyer.* Available from: http://dx.doi.org/10.2139/ssrn.2992962 [Accessed 05 May 2022].

[38]   *Convention on the Recognition and Enforcement of Foreign Arbitral Awards,* 10 June 1958. Available from: http://www.newyorkconvention.org/11165/web/files/original/1/5/15432.pdf [Accessed 23 June 2022].

[39]   Cortes, P. (2010) *Online Dispute Resolution for Consumers in the European Union. Routledge Research in IT and E-commerce Law.* London: Routledge, Taylor & Francis Group. Available from: https://www.econstor.eu/bitstream/10419/181972/1/391038.pdf [Accessed 23 June 2022].

[40]   Ibid.

[41]   Lodder, A. R. and Zeleznikow, J. (2005) Developing an Online Dispute Resolution Environment: Dialogue Tools and Negotiation Support Systems in a Three-Step Model. *Harvard Negotiation Law Review,* 10, pp. 287–337.

In addition, the described method of dispute resolution is obviously devoid of a standard of efficiency, since there is no possibility to limit in advance the range of checks used by arbitrators, who may not respect the accumulated experience in resolving similar cases. As a result, a decentralized court decision will become more and more resource- -intensive over time, as the parties will try to determine all possible circumstances in the program code. In other words, the parties will have to discuss each dispute from the very beginning, without any knowledge of the previous cases.

Besides, problems arise with the method of selection of the arbitrators as well as ways of making their decisions. Arbitrators are selected randomly, but from a certain group of specialists in the blockchain area, which is not very big now. For that reason, there is a risk that the arbitrators will not be independent of the parties.

To sum up, neither of these two alternative mechanisms can provide an adequate environment for resolving disputes arising from smart contracts. Therefore, in the next paragraph, I introduce the design and implementation of a hybrid for the digital dispute.

4. HYBRID APPROACH

In light of the shortcomings of the available dispute resolution mechanisms for the crypto economy, it is possible to talk about instituting a hybrid approach. It means the creation of an independent, decentralized platform that integrates both approaches to the smart contract dispute resolution problem. This framework recognizes internal mechanisms of the smart contract system that will regulate disputes depending on the precise nature of the case and certain circumstances.

Parties should incorporate a mandatory dispute settlement clause directly in the smart contract code.

Such a clause may include the following provisions:

a) automatic adoption of interim measures (for example, suspension of performance of obligations under a smart contract, blocking of funds);

b) rules and deadlines for the creation of arbitration;

c) procedure and deadlines for dispute resolution;

d) procedure for the execution of arbitration awards; it means technical standards that allow smart contracts to be reversed;

e) an agreement between the parties to resolve disputes using on-chain resolution platforms. The lack of agreement between the parties should lead to resolve the dispute with an on-chain system;

f) a clause regulating dispute resolution. For instance, by including an ICC Arbitration Clause in a contract, the parties agree that their dispute will be resolved by arbitration and that the arbitration proceedings will be governed by the procedural rules in the ICC Rules of Arbitration, given the finality and binding effect of an arbitral award for the parties.

Even if the dispute was resolved with "on chain" mechanisms, the interested party should still have the right to appeal to the off-chain arbitration. In these cases, decisions reached by way of blockchain arbitration should not rise to the level of "off chain" arbitration.

To be specific, the off-chain arbitration should be viable for the following cases:

- the disputes where one party is a consumer (taking into account the level of consumer protection existing in the EU and its Member-States);

- the complex disputes (i.e. it is necessary to examine additional evidence, to assign an expert examination or to hear witness testimony);

- the procedure may lead to the disclosure of commercial secrets;

- the disputes where fundamental rights are at stake.

This last condition is due to the impossibility to predict at the moment of drafting the contract, what kind of disputes may arise between the parties in the interpretation and performance of the contract. Therefore, it should be possible for the parties to consider the dispute using traditional arbitration.

Generally speaking, on-chain resolution platforms could be used for resolving minor disputes (with a small cost), for instance cross-border consumer disputes. Moreover, they could be used for technical disputes, such as gas or share price determination and construction schedule disputes. In other words, an "on chain" arbitration system could act as an expert to resolve factual issues, such as whether a contract performance complied with technical specifications, to calculate the market value of shares or commodities, or to calculate damages. In these cases, the parties may agree that the "on chain" arbitration award will be binding.

The ability of the parties to resolve disputes with online forms is of high importance due to several benefits. Firstly, the high speed of online procedures. Off-chain arbitration is not able to cope with the huge number

of online disputes. Secondly, the absence of on-chain resolution would negate key blockchain benefits and would undermine the evolution of the crypto economy.

However, on-chain arbitration requires the adaptation to the existing legal regulation, primarily to the requirement of the New York Convention to an arbitration agreement to be in writing. Otherwise, smart contracts run the risk of not being enforced under the New York Convention, unless they have an equivalent traditional word-format contract signed by both parties. In this regard, it seems appropriate to have a hybrid version of smart contracts, whereby there is a text-based version of the same force in addition to the encrypted-coded-language smart contract.

All these considerations are compelling and favor a hybrid approach. Given the current legal framework, fully "on chain" arbitration will not become a reality in the nearest future. At the same time, prospects of a hybrid approach are much more likely. It will reflect the complex nature of blockchain technologies and the diversity of smart contracts used in a dynamically competitive environment. On the one hand, the possibility of using "on chain" arbitration will lead to speedy, less-costly awards, to the benefit of parties in various specific sectors. Thus, the essence of a smart contract will be reflected in comparison with a traditional contract. On the other hand, "off chain" arbitration in certain cases seems to be unavoidable given the legal realities of the modern world.

5. CONCLUSION

All in all, building and implementation of the effective dispute resolution into smart contracts will be a crucial step in achieving level of certainty in crypto transactions and facilitating the broadening evolution of the crypto economy. Different mechanisms described above for resolving smart contracts demonstrate various possibilities, opting human-driven resolution systems or crowdsourced systems.

The development and introduction of new technologies should be convenient for the participants, diminishing their risks and making it possible to protect their rights in a faster manner. Besides, the use of technology could be advantageous for the justice system, which could be relieved of the burden of deciding certain kinds of disputes.

The hybrid approach that I suggest in this article addresses problems that neither the "on chain" nor "off chain" approaches can address

separately. I argue that for some reasons, hybrid solutions are more adequate given the framework of the Internet Age. The world is rapidly changing, and laws will have to adapt to this rising tide. As such, the growth of smart contracts will require adaptation by the legal profession and modification of approaches to dispute resolution. In doing so, though, contract law should operate according to its traditional canons and categories, through a modification and supplementation of existing rules and procedures.[42] And these technologies should be seen as an improvement of existing contractual structures in terms of their effectiveness. They cannot definitely change the essence of dispute resolution relationships between the parties.

Without a doubt, using a hybrid architecture can substantially improve the dispute resolution from smart contracts while retaining existing traditional law rules and principles. However, there is a room for specification of the individual conditions of "on chain" and "off chain" arbitration.

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