ONLINE DISPUTE RESOLUTION AND DIRECT ENFORCEMENT IN THE AGE OF SMART CONTRACTS

Master Thesis on International Business Law Program

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Tilburg Law School 2018

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ABSTRACT

Smart contracts are digital transaction tools enabling parties to enter into agreements which are going to be executed automatically by means of computer. Technological developments in the last decade, such as the advent of the blockchain, made smart contracts usable in real world scenarios. Start-up companies and major enterprises are introducing new projects that adopt smart contract solutions. However, despite having significant differences with the traditional paper-based contracts, smart contracts are still subject to current legal frameworks of the states. Thus, the thesis makes a comparative study of smart contracts' enforceability under contract laws. In order to do so, the thesis provides a business law perspective about decentralized autonomous organizations, new type of unincorporated entities operating through smart contracts. Furthermore, we investigated the potential use of the blockchain in the enforcement phase of a contract, in particular in the context of dispute resolution. The thesis argues that concomitant use of online dispute resolution and smart contract may increase the efficiency of both of them. In that regard, the thesis also addresses smart contracts as a self-help mechanism comparing it with the existing ones.

Key Words: Distributed Ledger Technology, Smart Contract, Contract Formation, Online Dispute Resolution, Decentralized Autonomous Organization

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ACKNOWLEDGEDMENTS

This thesis would not have been possible without the advice and support of many people.

First, and foremost, I would like to thank my thesis advisor Luca Tavecchio for his continuous support and valuable guidance throughout this study. He consistently allowed this paper to be my own work, but steered me in the right direction whenever I needed so. For any faults, I take full responsibility.

I would like to extend my sincere thanks to our program director, Prof. Erik P. M. Vermeulen, and other faculty members for designing an outstanding masters program which immensely improved my knowledge and vision. I am grateful to them for giving me the opportunity to study in their graduate program.

My sincere thanks also goes to my esteemed colleagues, Atty. Mehmet M. Gençoğlu and Res. Asst. Ahmet Arslan, for their passionate willingness to exchange ideas with me about the thesis and providing me endless support in spite of their tight schedule. Great thanks to Philip Smith, who sacrificed his valuable time to review my language.

Last but not least, I would also like to thank and express my deepest gratitude and love to my family, who supported and encouraged me throughout my life. This thesis is heartily dedicated to my mother, Horise Bayramoğlu. You are gone, but your belief in me has made this journey possible.

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LIST OF ABBREVIATIONS

ADR	Alternative Dispute Resolution
AI	Artificial Intelligence
AML	Anti-Money Laundering
AODR	Alternative Online Dispute Resolution
B2B	Business to Business
B2C	Business to Customer
C2C	Customer to Customer
CEO	Chief Executive Officer
CISG	United Nations Convention on Contracts for the International Sale of Goods (1980)
CJEU	Court of Justice of the European Union
DAMN	Decentralized Arbitration and Mediation Network
DAO	Decentralized Autonomous Organization
DLT	Distributed Ledger Technology
DLT Order	Ordonnance n° 2017-1674 du 8 décembre 2017 relative à l'utilisation d'un dispositif d'enregistrement électronique partagé pour la représentation et la transmission de titres financiers
EC Convention	The Convention on the Use of Electronic Communication in International Contracts (2005)
EC Model Law	The Model Law on Electronic Commerce (1996)
EDI	Electronic Data Interchange
eIDAS Regulation	Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC
ESIGN Act	The Electronic Signatures in Global and National Commerce Act
ETH	Ethereum
EU	European Union
EULA	End-user License Agreement
EVM	Ethereum Virtual Machine
ICANN	Internet Corporation for Assigned Names and Numbers
ICO	Initial Coin Offering
IEE	The Institute of Electrical and Electronics Engineers
IoT	Internet of Things
IP	Internet Protocol
KYC	Know Your Customer
NASDAQ	National Association of Securities Dealers Automated Quotations

NCCUSL	National Conference of Commissioners on Uniform State Laws
New York Convention	Convention on the Recognition and Enforcement of Foreign Arbitral Awards (1958)
NZ	New Zealand
ODR	Online Dispute Resolution
OECD	Organization for Economic Cooperation and Development
PICC	International Institute for the Unification of Private Law Principles of International Commercial Contracts (2016)
SEC	U.S. Securities and Exchange Commission
ToU	Terms of Use
U.S.	United States
U.S.C.A	U.S. Code Annotated
UCC	Uniform Commercial Code
UDRP	Uniform Domain-Name Dispute- Resolution Policy
UETA	The Uniform Electronic Transactions Act
UNCITRAL	United Nations Commission on International Trade Law
USA	The United States of America
USD	United States dollar
VAT	Value Added Tax
WIPO	World Intellectual Property Organization

"The factory of the future will have only two employees, a man and a dog. The man will be there to feed the dog. The dog will be there to keep the man from touching the equipment".

Warren G. Bennis; as cited in Mark Fisher (1991) The Millionaire's Book of Quotations, p. 15.

INTRODUCTION

1) Background and Problem

Distributed Ledger Technology (DLT[1]) is potentially disruptive innovation which purports to make fundamental changes in how we interact and transact. DLT may in the near future enable us to conduct permanent, immutable peer-to-peer transactions over secure, decentralized platforms while monitoring ownership and transfers of property without needing an intermediary[2]. Therefore, the hallmark of this technology is that it heralds a new solution for the trust problem by introducing the concept of "*trustless trust*"[3]. Not surprisingly, over the last decade, owing its nearly limitless potential applications[4], the phenomenon of DLT is increasingly being discussed in academia and different business sectors.

When it comes to legal tech reflections of DLT, smart contracts[5] are one of the prominent novelties. The idea itself is not new[6], however, new technology provides not only

[1] We see different definitions with regards to the DLT and blockchain since there is no consensus yet reached on the terminology. ("*There is not yet an agreement on the terminology. Technically, a blockchain (sometimes rendered as block chain) is a data storage system using sequentially signed blocks (…). 'The Blockchain' may describe the universe of blockchains (similar to 'the internet'), the subset of public blockchains, or just the public ledger for Bitcoin. 'Distributed ledger' is a more general term for the primary application of blockchains*.") See: **Werbach**, K. D. (2017). Trust, But Verify: Why the Blockchain Needs the Law. Berkeley Technology Law Journal. Forthcoming. Available at: https://ssrn.com/abstract=2844409 (last visit: 30.04.2018).

[2] According to Richard Gendal Brown, DLT is a bundle of five different services (consensus, validity, uniqueness, immutability and authentication) which can be used in different combinations to solve different problems. **Brown**, R. G. (April 5, 2016). Introducing R3 Corda™: A Distributed Ledger Designed for Financial Services. Available at: https://gendal.me/2016/04/05/introducing-r3-corda-a-distributed-ledger-designed-for-financial-services (last visit: 30.04.2018).

[3] Entrepreneur Reid Hoffman uses this term in order to emphasize the decentralized nature of Bitcoin. **Hoffman**, R. (May 15, 2015). Why the Blockchain Matters? Available at: http://www.wired.co.uk/article/bitcoin-reid-hoffman (last visit: 30.04.2018).

[4] Bitcoin blockchain, Ethereum, Hyperledger, Ripple are the few examples of these projects. It is important to keep in mind that different blockchains have different characteristics.

[5] There is no established definition or official legal status of the smart contracts. **Lauslahti**, K., **Mattila**, J., **Seppälä**, T. (2017). "Smart Contracts – How will Blockchain Technology Affect Contractual Practices?" ETLA

new means to establish more complex systems in practice in order to realize old dreams, but also ways to increase efficiencies of existing systems. From a legal perspective, the distinguishing feature of smart contracts is self-enforcement[7]. Until now, in contract law theory, enforcement has been correlated with state-sanctioned preservation of parties' economic interests[8]. However, smart contracts challenge this approach, by putting forward automated enforcement and automated recording. Unlike the traditional legal rules which are being enforced *ex post*, regulation by code enables parties to impose obligations on individuals in a way that can be enforced *ex ante*[9]. Moreover, blockchain[10]-based contracts also have the ability to automate the conclusion phase of contracts, by using electronic agents. However, it is debatable whether some types of smart contracts are actually contracts at all, in the light of contract law. Nonetheless, despite all current legal and technical pitfalls in practice, smart contracts might be regarded as a "*paradigm shifter*" in terms of the contract law doctrine[11].

Notwithstanding that, the potential of smart contracts reaches further than allowing crypto transactions. We suggest that smart contracts can be employed in a way to facilitate

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Reports No 68, p. 11. Available at: https://pub.etla.fi/ETLA-Raportit-Reports-68.pdf (last visit: 30.04.2018); for different definitions, see: Section I.

[6] The idea has a deep-rooted history going back to the Roman era. Vending machines are acknowledged as primitive ancestors of smart contracts. The earliest known reference to a vending machine is documented by Hero Ctesibius of Alexandria in a journal published in 62 A.D. See: **Savelyev**, A. (2016). Contract Law 2.0: «Smart» Contracts As the Beginning of the End of Classic Contract Law, Higher School of Economics Research Paper No. WP BRP 71/LAW/2016, p.8. Available at: https://ssrn.com/abstract=2885241 (last visit: 30.04.2018).

[7] **Raskin**, M. (2017). The Law and Legality of Smart Contracts. Georgetown Law Technology Review 304, p. 321.

[8] **Mik**, E. (2017). Smart Contracts: Terminology, Technical Limitations and Real World Complexity, p. 10. Available at: https://ssrn.com/abstract=3038406 (last visit: 30.04.2018).

[9] **Filippi**, P. D., **Hassan**, S. (2016). Blockchain Technology as a Regulatory Technology: From code is law to law is code. First Monday, Peer Review Journal on the Internet. Available at: http://firstmonday.org/ojs/index.php/fm/article/view/7113/5657 (last visit: 30.04.2018).

[10] In this paper, we use the term of blockchain as, "*a decentralized, immutable ledger operating on cryptographic technology between a peer-to-peer network of computers ('nodes')*". **Sherborne**, A., Blockchain, Smart Contracts and Lawyers (2017). International Bar Association, p. 1. Available at: https://www.ibanet.org/Document/Default.aspx?DocumentUid=17BADEAA-072A-403B-B63C-8FBD985D198B (last visit: 30.04.2018).

[11] **Savelyev**, p. 9.

dispute resolution. Finding a better direct enforcement mechanism has become more of an issue, as cross-border online transactions have increased gradually[12] and Online Dispute Resolution (ODR) mechanisms have become more important for both B2C (business-to-customer) and B2B (business-to-business) disputes since access to public courts is not very easy or affordable for each dispute. On the other hand, there is no certainty about how ODR judgments can be enforced in different jurisdictions, due to the lack of uniform legal instruments[13]. Indeed, some mechanisms like user review systems, trustmarks, chargebacks, escrow accounts etc. are being thoroughly used to facilitate enforcement; but nevertheless, each of them rely on a certain degree of trust in an intermediary, which means that they are vulnerable to fraudulent behavior. Additionally, applicability of the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York Convention) can be controversial depending on whether the certain type of ODR can be recognized as arbitration[14].

On the other side of the coin, ODR's role in the viability of the smart contracts might be regarded as vital as smart contract's suggested role in the ODR. In our hypothesis, under the elusiveness of present legal systems, incorporating arbitration clauses into smart contracts is the most viable way to avoid uncertainty over jurisdiction and governing law, identification problems in suing someone and problems that could stem from irrevocability. Usage of blockchain-based arbitration mechanisms in ODR processes might potentially accomplish

[12] Cross border e-commerce is anticipated to reach one trillion dollars as of 2020. For an infographic which shows trends and statistics concerning cross border shopping, see: **Saleh**, K. (May 27, 2016). Cross Border Shopping- Statistics and Trends. Available at: https://www.invespcro.com/blog/cross-border-shopping (last visit: 30.04.2018).

[13] UNCITRAL Working Group III convened from 2010 to 2016 having the objective of drafting a new uniform legal instrument. Eventually they were only able to draft a non-binding descriptive document which was named thereafter "UNCITRAL Technical Notes on Online Dispute Resolution". The European Commission is also fully aware of these problems and integrated ODR and ADR policy programs into the European Digital Agenda. In addition, the EU established an ODR platform through promulgating the ODR Regulation (524/2013) and ADR Directive (2013/11/EU). Full text of the Regulation is accessible at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:165:0001:0012:EN:PDF (last visit: 30.04.2018).

[14] Significant problems arise especially when it comes to the acceptance of pre-dispute arbitral clauses in consumer cases. In USA, where the prominent actors of e-commerce industry such as Amazon and eBay are located, consumer arbitration is recognized and the chargeback method is frequently used as an enforcement alternative. However, EU member states' legislations generally do not permit pre-dispute consumer arbitration and EU's regulatory framework yet to be seen after the implementation phase. See: **Koulu**, A. R. (2016). Dispute Resolution and Technology: Revisiting the Justification of Conflict Management. University of Helsinki Conflict Management Institute, p. 233.

direct private enforcement[15] and, in case of any need, might ensure the application of the widely-affirmed New York Convention[16]. Moreover, the possibility of appointing specialist tribunals can be seen as essential if we keep in mind that particularly when there is no legal prose, most of the judges would not even understand what the smart contract contains, due to complicated programming languages.

For all the abovementioned reasons, circumstances have introduced the need for scrutinizing the relationship between DLT and the current legal climate, as well as the usage of smart contracts and their arbitrability. Therefore, this paper provides analysis of the enforceability of smart contracts, legal status of smart contract based organizations called "*Decentralized Autonomous Organizations (DAOs)*" and smart contracts' potential implementation as a potential private enforcement facilitator, particularly focusing on the following issues:

a) Formation of smart contracts according to the general contract law theory, common legal instruments of international commercial arbitration and USA (common law) and France (civil law) examples.

b) Existing direct private enforcement models and what smart contracts can bring in.

c) Regulatory gaps and potential solutions, especially corporate law and security law issues, related to DAOs.

2) Hypothesis

Since smart contracts possess unprecedented characteristics, current legal systems do not provide sufficient framework for complete implementation of smart contract applications.

[15] We use the phrase "private enforcement" for both enforcements commenced by private parties but taken over by public officials, as well as fully conducted by private parties. "Direct" is referring to the system in which itself implements the outcome of the proceedings. It is the antonym of the "indirect" which means that the private system relies on the willingness to comply with judgments. In that scenario, using some incentives, compliance is trying to be made attractive. **Kaufmann-Kohler**, G., **Schultz**, T. (2004). Online Dispute Resolution: Challenges for Contemporary Justice (2004). Kluwer Law International, p. 224-225.

[16] As of February 2018, the New York Convention is binding upon 157 signatory states, whose share constitutes a huge percentage of world trade. As it stands, it is one of the most successful international treaties in terms of application area. An up-to-date list of contracting states is available at: http://www.newyorkconvention.org/countries (last visit: 30.04.2018).

Therefore, not only relevant laws should be amended and adapted to this new technology, but also new coding standards should be developed in order to ensure the legal compliance which is going to facilitate DLT to reach its potential, including becoming an enforcement alternative for online disputes.

3) Objectives of the Study

a) To explain the chronological background behind blockchain and smart contracts and to establish a connection with the alleged *Lex Cryptographia* and the emergence of the *Lex Mercatoria*.

b) To discuss practical advantages and disadvantages of smart contracts and to introduce potential ideas which may minimize the effects of the drawbacks.

c) To compare the smart contract based enforcement model with current successful ODR models and private enforcement mechanisms such as escrow and chargebacks.

d) To do a comparative study on legality of formation of smart contracts under two important common law and civil law jurisdictions: USA and France.

e) To analyze DAO's under different aspects of the business law, particularly corporate law and the securities law.

f) To propose legal solutions for regulators for the long run and to propose practical solutions for users to clear the current hurdles resultant aforementioned issues.

4) Scope of the Study

Investigating the possible role of smart contracts and DAO's in modern business in a comparative law perspective with a specific focus on their legal status, characteristics of the blockchain-based self-enforcement and its possible application in online dispute resolution systems. Furthermore, we will scrutinize what the abovementioned blockchain dispute resolution system brings into the current direct enforcement mechanisms and transnational regulations on arbitration.

5) Methodology

The thesis is based on a documentary research which comprises legal publications and articles, decisions of domestic and international cases, online media and databases, whitepapers and reports, conference proceedings as well as opinions of legal practitioners and technologists.

6) Expected Results

a) To understand the general concept of DLT, DAOs and smart contracts.

b) To understand contract law principles of common law and civil law jurisdictions as well as international legal instruments which are commonly applicable in international arbitration. To understand possible interpretation of these principles in the context of different types of smart contracts.

c) To understand technical and legal challenges and obstacles which stand ahead of the widespread adoption of smart contracts.

d) To evaluate the latest legal developments and business enterprises and to be able to provide recommendations for practitioners and regulators concerning the implementation of smart contracts.

The remainder of this paper is organized as follows:

Section I discusses the terminology and historical background of smart contracts and the rise of *Lex Cryptographia.*

Section II examines the usage of smart contracts and their pros and cons in comparison with other private enforcement mechanisms which are being used in ODR.

Section III attempts to ascertain the legal status of smart contracts, under certain specific civil and common law jurisdictions.

Section IV concludes the paper.

SECTION I

1) Terminology: What Makes a Contract "Smart"?

There are various definitions of smart contracts. Nevertheless, different definitions can be classified under two main categories[17]. Some of these definitions adopt a technological perspective, using the term of "contract" irrespective of any legal meaning. In that sense, the term "contract" has an operational meaning referring to, "*software agents are fulfilling certain obligations and exercising certain rights, and may take control of certain assets within a shared ledger*[18]". They are entitled as *smart contract codes.* Conversely, the second group focuses on how legal contracts are embedded in software and how the legal prose should be interpreted[19]. These are entitled as *smart legal contracts.* In the view of such distinction, every smart legal contract comprises at least a piece of smart contract code, however, every piece of smart contract code does not constitute a smart legal contract[20]. Despite using the term of "smart contracts" in this paper covering both definitions, we are mainly going to focus on smart legal contracts.

A legal scholar and cryptographer Nick Szabo's definition, is a good starting point for understanding the concept, since he was the person who envisaged this phenomenon, as early as 1994[21]. Szabo simply described smart contracts as "*a computerized transaction protocol*

[17] **Stark**, J. (June 4, 2016). Making Sense of Blockchain Smart Contracts. Available at: https://www.coindesk.com/making-sense-smart-contracts/ (last visit: 30.04.2018). It is crucial to state that there is no clear distinction in technical writings and that interchangeable usage sometimes entails confusion.

[18] **Clack**, C.D., **Bakshi**, V.A., **Braine**, L. (2016). Smart Contract Templates: foundations, design landscape and research directions. arXiv: 16008.00771[cs.CY], p.2. Available at: https://arxiv.org/abs/1608.00771 (last visit: 30.04.2018).

[19] Id, p.2; notwithstanding that the definitions include some type of automated and self-executing transaction, smart contract, as a term, is usually used interchangeably as covering a wide range of different concepts such as smart legal contracts, digital code, smart contract code etc. **Cohn**, A., **West**, T., **Parker**, C. (2017). Smart After All: Blockchain, Smart Contracts, Parametric Insurance, and Smart Energy Grids. Georgetown Law Technology Review, 1 (2), 273-304, p. 280.

[20] **ISDA**, **Linklaters** (2017). White Paper: Smart Contracts and Distributed Ledger- A Legal Perspective. Available at: https://www.isda.org/a/6EKDE/smart-contracts-and-distributed-ledger-a-legal-perspective.pdf (last visit: 30.04.2018).

[21] **Szabo**, N. (1994). Smart Contracts. Available at: http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html (last visit: 30.04.2018); an alternative definition describes smart contract as, "*a computer program capable of making decisions when certain conditions are met*." **Kolvart**, M. (et al.) (2016). Smart Contracts, p. 134. In: The Future of Law and eTechnologies, **Kerikmäe**, T., **Rull**, A. (ed.). Springer.

that executes terms of a contract"[22] or "*a set of promises, specified in digital form, including protocols within which the parties perform on these promises*"[23]. However, this description is not sufficient to unbundle all elements of the "contemporary" smart contracts, and therefore, is failing to articulate the differences between already known tools providing automated performance such as vending machines, which are characterized as "*primitive ancestors of smart contracts*"[24] by Szabo[25]. Yet, in the legal sense, a vending machine is an offer made for everyone, not a contract itself[26]. In addition, a vending machine does not competent to *enforce* a contract; it has a limited function of dispensing goods when the payment is made, and other terms of a contract cannot be embodied[27]. Moreover, a vending machine merely automates one parties' performance and still requires interference from the other party. Last but not least, whilst owner of the vending machine has a discretion to interrupt the performance after commencement of the transaction by shutting the machine down, due to the decentralized nature of the smart contracts, interference is not possible for both parties[28].

Keeping in mind the inadequacies of different definitions, we embrace *Clack et al.*'s definition which sufficiently encompasses both smart contract codes and smart legal contracts: "*A smart contract is an automatable and enforceable agreement; automatable by computer, although some parts may require human input and control. Enforceable either by legal enforcement of rights and obligations or via tamper-proof execution of computer code*[29]". This description is also useful to locate "hybrid" or "split" contracts, which's clauses are

[22] **Szabo**, supra note 21.

[23] **Szabo**, N. (1996). Smart Contracts: Building Blocks for Digital Markets. Available at: http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_2.html (last visit: 30.04.2018).

[24] **Szabo**, N. (1997). The Idea of Smart Contracts. Available at: http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_idea.html (last visit: 30.04.2018); other example given by Szabo is that automobile starter interrupters.

[25] **Savelyev**, p.7.

[26] **Mik**, supra note 8, p.5.

[27] Id, p.5.

[28] **Savelyev**, p.17.

[29] **Clack et al.**, p.2.

partly encoded into the software and require further human input, in terms of legal interpretation, and function of the oracles[30].

In conclusion, two additional features distinguish smart contracts from traditional contracts. First, in contrast to traditional contracts, performance is independent from parties' actions. Smart contracts are capable of execution, at least partially. Second, whereas traditional contracts need state intervention in case of non-performance, smart contracts are subject to tamper-proof[31] execution and in case of any problem, state intervention is also possible[32] if smarts contracts are recognized as legally binding contracts in that particular jurisdiction. Therefore, the legal status of smart contracts' is crucial in terms of smart contract based (or automated) dispute resolution.

2) Timeline of the Smart Contracts: Chronological Events

Smart contracts represent the unification of two different areas of technological development: electronic contracting and cryptography[33]. After being envisioned by Szabo, the smart contract idea laid dormant for many years due to the lack of technological platform which puts the idea into practice. Accordingly, the year of 2009 can be regarded as a milestone, due to the fact that unidentified Satoshi Nakamoto released the renowned white paper of Bitcoin blockchain[34].

Historically, parties need intermediaries when they decide to make digital transactions, due to easy reproducibility of digital assets, such as money, intellectual property rights etc. This fact gives rise to the "*double spending problem*", which is a threat of spending the same

[30] Oracles are digital agents in which collect and verify information about off-chain events, and they are nor trustless nor decentralized.

[31] Temper-proof execution means that performance only depends on consummation of an autonomous technological process, without affect of parties' actions. **Clifford Chance Law Firm**. Are Smart Contracts Contracts? (2017). Available at: https://www.cliffordchance.com/briefings/2017/08/are_smart_contractscontracts.html (last visit: 30.04.2018).

[32] Id, p. 3; **Kolvart et al**., p. 137.

[33] **Werbach**, K., **Cornell**, N. (2017). Contracts Ex Machina, Duke Law Journal. 67, 313-382, p. 320.

[34] **Nakamoto**, S. (2009). Bitcoin: A Peer-to-Peer Electronic System. Available at: https://bitcoin.org/bitcoin.pdf (last visit: 30.04.2018).

unit of value more than once[35]. In fact, the main purpose of Nakamoto's system was to prevent double spending by the medium of a decentralized environment[36]. The solution was making all transactions visible (to everyone). As a result, Bitcoin's blockhain enables anyone to see any past transactions, including original "*genesis block*", created by Nakamoto, by means of monitoring the transactions all the way back[37]. Theoretically, every block is linked to each other in an immutable sequence and even though it is not impossible, it is unreasonably hard to alter anything on the ledger via a hacker attack or a fraudulent behavior. There is no central storage where the date is maintained. Instead, each computer node belonging to network, conserve a complete copy of the blockchain, and owing to the broadcast among nodes, valid blocks are added on the blockchain on a regular basis[38]. Validation is provided by a consensus mechanism incentivized by a reward called "mining" or "*proof of work*"[39]. This mechanism not only gives a reason to behave honestly to participants, but also strengthens the system by compelling the malicious actors to struggle against total computer power of the network[40], just because consensus denote that more than half of the users (nodes) must affirm it[41].

In spite of all aforementioned features of the Bitcoin blockchain, it did not envisage smart contracts, and its application has been remained limited to generation and to the transfer of the tokens between accounts[42]. In 2013, seeing this deficiency, Russian-Canadian

[35] **Sherborne**, p. 41.

[36] **Nakamoto**, p.1.

[37] **Werbach**, **Cornell**, p. 327.

[38] **Nakamoto**, p.3.

[39] As of 2018, the number of Bitcoin's awarded per block is 12.5. It is going to be halved in 2020. For technical explanation of the process, see: **Nakamoto**, p.3.

[40] **Werbach**, **Cornell**, p. 328.

[41] In 2014, one of the mining pools called ghash.io came close to 51% of the total CPU power of the Bitcoin network twice (in January and June) without malice. In order to find a proper solution for this situation, they decided jointly with the other pools that none of them shall exceed 29.99% of the total CPU power of the Bitcoin network, and in case of any overpass, the pool relative to the overpass shall take necessary measures. **Çarkacıoğlu**, A. (December, 2016). Kripto-Para Bitcoin. Turkish Capital Markets Board Research Paper, p. 61. Available at: http://www.spk.gov.tr/SiteApps/Yayin/YayinGoster/1130 (last visit: 30.04.2018).

[42] **Mik**, supra note 8, p.6.

programmer Vitalik Butelin published an article introducing a new kind of blockchain-based and smart contract focused platform, Ethereum[43], and launched the platform two years later. Conceivably, as one of the most ambitious crypto-ledger projects that is built on blockchain so far[44], Ethereum is equipped with the ability to form more complex smart contracts utilizing an "if-then algorithm". The Ethereum Virtual Machine (EVM) enables coders to generate hypothetically unlimited potential applications including but not limited to creating markets, registries of debts or promises which operates according to instructions, without needing a middleman. Furthermore, developers are not obliged to use EVM's opcode; instead, they can use high-level and much more sophisticated programming languages such as Solidity[45] or Serpent[46]. Finally, in comparison to Bitcoin, Ethereum has a better capacity when it comes to transactions per second[47]. Currently, it is neither a real advantage nor a drawback. However, if DLT is being used in business thoroughly in the future, it might constitute an important feature.

Despite being promising, if we evaluate all these developments which occurred over the course of a little bit more than two decades, there are still some significant obstacles in front of the widespread adoption of the smart contracts. Latency, bandwidth and storage constraints, high drafting costs[48], security related issues such as 51% attacks and forking[49],

[43] According to white paper; "*What Ethereum intends to provide is a blockchain with a built-in fully fledged Turing-complete programming language that can be used to create "contracts" that can be used to encode arbitrary state transition functions, allowing users to create any of the systems described above, as well as many others that we have not yet imagined, simply by writing up the logic in a few lines of code.*" Up-to-date version of the white paper is available at: https://github.com/ethereum/wiki/wiki/White-Paper (last visit: 30.04.2018).

[44] **Marino**, B., **Juels**, A. (2016). Setting Standards for Altering and Undoing Smart Contracts (2016), In Rule technologies. Research, tools and applications: 10th international symposium, New York, RuleML 2016. Proceedings: **Alfares**, J.J. (et al.). Springer International Publishing. 151-166, p.158; for another smart contract focused platform, see: Codius, https://codius.org/ (last visit: 30.04.2018).

[45] https://solidity.readthedocs.io/en/develop/ (last visit: 30.04.2018).

[46] https://github.com/ethereum/wiki/wiki/Serpent (last visit: 30.04.2018).

[47] Bitcoin is limited to 3-7 transactions per second, whilst Ethereum is capable of 7-15. See: **Barrera**, A. (February 12, 2018). Are Smart Contracts Really Needed? Available at: https://medium.com/@abarrera/are-smart-contracts-really-needed-8ebac81c91b (last visit: 30.04.2018).

[48] While smart contracts reduce *ex post* costs such as monitoring and enforcement, on the other hand, they raise *ex ante* costs and this makes them more expensive than paper contracts in most cases. Negotiation costs which are referring to deciding on all the contingencies, technology related costs such as employing programmers for drafting, electricity costs, EVM transaction costs are some of the important cost items. Standard rules might reduce the *ex ante* costs significantly.

lack of coding standards for contracts and limited nature of the computer language[50] can be given as examples. However, it should not be forgotten that after the advent of World Wide Web, e-commerce took 20 years to hold on and another two decades to reach maturity[51]. In a nutshell, the point arrived is not a pessimistic scenario. Fortunately, technical solutions are already being developed to solve the aforementioned issues[52]. In the 2020's, it would not be a surprise to see smart contracts being used at scale[53].

3) Smart Contracts in Action: Emergence of *Lex Cryptographia*?

Due to the DLT breakthrough, the world is going through the same astonishment Marco Polo had in the 13th century when he saw Chinese people using stamped paper as means of payment instead metal coins[54]. Historically, people, and particularly merchants, are tend to find new "self-help" solutions in order to establish more robust business models. Due to the fact that it occurs outside of the state intervention, new set of legal rules are an integral part of this self-help process for it to be successful. The underlying rationale of this cycle can be explained as follows: A trade expansion changes the legal needs which are unmet by the existing systems. Thus, merchants find themselves in a position in which they can only rely

[49] Forking is a term being used to explain situations in which some nodes in the community choose to build a separate block than others.

[50] In the future, things can change due to the developments in artificial intelligence. However, Cass Sunstein argues that: "At present state of art, artificial intelligence cannot engage in analogical reasoning or legal reasoning." **Sunstein**, C. R. (et al.) (2001). Symposium: Legal Reasoning and Artificial Intelligence: How Computers Think Like Lawyers. University of Chicago Law School Roundtable. 8 (1), 1-28, p. 19. As cited in: **Surden**, H. (2012). Computable Contracts. U.C. Davis Law Review, 46, 629-700.

[51] **Morrison**, A. (March 20, 2016). Blockchain and smart contract automation: an introduction and forecast. Available at: http://usblogs.pwc.com/emerging-technology/blockchain-and-smart-contract-automation-an-introduction-and-forecast/ (last visit: 30.04.2018).

[52] **Norton Rose Fulbright Law Firm** (2016). Unlocking the blockchain: a global and regulatory guide. Available at: http://www.nortonrosefulbright.com/files/unlocking-the-blockchain-chapter-1-141574.pdf (last visit: 30.04.2018). For solutions, see: p. 25-30.

[53] **PwC**'s expectation. Id; according to the World Economic Forum's Report in 2015, it is anticipated that by 2027, around 10% of the world's GDP will be connected to blockchain based technologies. See: **World Economic Forum** (2015). Deep Shift. Technology Tipping Points and Societal Impact. Survey Report, p. 24.

[54] **Künnapas**, K., From Bitcoin to Smart Contracts: Legal Revolution or Evolution from the Perspective of de lege ferenda? p.111, In: **Kerikmäe**, T., **Rull**, A. (ed.) (2016). The Future of Law and eTechnologies. Springer.

on self-regulation and self-help where the best practices convert into usage and trade custom, which are applicable in commercial disputes[55]. Specialized merchant courts which are usually empowered by authorities competent to conduct custom duties, operate in many places (trade fairs, harbors etc.) and solve the disputes in accordance to new law[56]. Finally, these efforts pave the way for a legal innovation, and eventually, new rules are being absorbed and integrated to the general legal system[57].

Development of the *Lex Mercatoria* (Merchant Law) and *Lex Informatica* [58] (Informatics Law) are the two prominent subsets of law in order to understand the recent discussion about *Lex Cryptographia* (Crypto Law). In the Middle Age, Europe, when advances in transportation was taken together with the legal uncertainty caused by fragmented country structures and weak central authorities, induced merchants to generate new set rules to conduct their affairs with other merchants. Furthermore, merchant courts gradually emerged around the trade nodes, acknowledging that rules are applicable for everyone irrespective of their geographical location. New courts were also essential for the viability of the rules, since the royal courts were usually avoiding cases pertinent to international trade or simply refused the validity of foreign agreements[59]. In parallel, subsequent to the World War II, revival of the world's transnational trade volume inclined scholars to resurrect to idea of the transnational commercial law and it has expedited the development of international commercial arbitration, which is today predominantly called as the new *Lex Mercatoria*[60].

[55] **Calliess**, G. P. (2015). Lex Mercatoria. ZenTra Working Paper in Transnational Studies No.52/2015, p.3. Available at: https://ssrn.com/abstract=2597583 (last visit: 30.04.2018).

[56] Id, p. 3.

[57] Id, p. 3. ; **Cutler**, A. C. (2003). Private Power and Global Authority: Transnational Merchant Law in the Global Political Economy. Cambridge University Press, p. 108 et seq.; this cycle is seen as a product of legal Darwinism, in the context that inadequate state rules are superseded by autonomous transnational rules responding to the needs of international commerce. The theory is also coherent to explain how arbitral legal order recognized by the international community after WWII even though having developed autonomously. **Ortolani**, P. (2016). Self-Enforcing Dispute Resolution: Lessons from Bitcoin. Oxford Journal of Legal Studies, 36 (3), 595-629, p. 613.

[58] Reidenberg defined the concept of Lex Informatica as the rules of information imposed by technology communication networks. **Reindenberg**, J. R. (1998). Lex Informatica: The Formulation of Information Policy Rules Through Technology. Texas Law Review, 76 (3), 553-593, p. 555.

[59] **Wright**, **Philippi**, p. 45.

[60] **Calliess**, p. 3.

Finally, as an extension of this process, widespread proliferation of the internet in the 90's has changed the commercial life and hence posed a serious challenge for traditional legal systems which are based on national borders and jurisdictions. The internet needed its own regulation (and dispute resolution outside the courts) to cater the needs which had arose due to dynamic structure and new concepts it had brought in. Internet service providers and online operators responded to that legal gap by drafting standardized terms of contracts which basically ignored provisions of national laws, to regulate their interactions with the customers[61].

Financial services, energy, transportation, healthcare, real estate, insurance and entertainment are only the few possible application areas of DLT. In that context, DLT alongside with Internet of Things (IoT) might have a similar impact on commercial life[62]. Accordingly, disruptive *modus operandi* creates new regulatory issues. Some of the possible reflections in practice are as follows: Pseudonymous nature of the blockchain raises concerns about compliance with tax law[63], competition law[64], Know Your Customer (KYC) and Anti-Money Laundering (AML) rules. Decentralized nature causes confusion on governing law and jurisdiction issues and brings up the issue of compliance with the criminal law[65] and security law disclosure requirements. Moreover, it is even ambiguous if smart contracts are binding under the contract law theory. Last but not least, decentralized autonomous organizations (DAOs) constitute a new concept. A DAO can be defined as *"an organization that runs autonomously, in a decentralized manner that functions without the need for centralized parties to make decisions for the organization to grow, to be profitable or*

[61] For example, End-User Licensing Agreements (EULA) and Terms of Use (ToU).

[62] Possible transformations are not limited with the private sector. Some public duties such as land registries and notary services are also expected to be evolved.

[63] DLT can be used to create a tax haven. One can set up different accounts and transfer money among them freely.

[64] For example, competitors engage in a collusion through blockchain or share commercially sensitive information among them. Also, a permissioned blockchain might function as a gate which excludes potential competitors.

[65] In that regard, regulatory constraints brought by the criminal law will prohibit disclosure of certain information to the public or to a group of miners for the sake of the protection of business secrets and banking secrecy. **Trüeb**, H. R. Smart Contracts, p. 711. In: **Pascal**, G., **Koller**, A., **Loacker**, L. D., **Wolfgang**, P. (ed.) (2018). Festschrift für Anton K. Schnyder, Schulthess Verlag, 723-734.

'physically' exist[66]*"*. Since it does not have a recognized legal status as an entity, whom is liable for its actions is vague. In Section III, we are going to discuss legal status of the smart contracts in depth and briefly introduce possible ideas of locating DAO's position in the legal sense.

To conclude, presently, the most discussion about *Lex Cryptographia* turns around whether new local regulations (or some uniform legal instruments[67]) are needed by the nature of the DLT[68]. In our point of view, unlike some enthusiastic advocates of blockchain embrace the discourse of "*code is law*[69]", which implies that code can supersede law and can create its own regime, even though code can guarantee the performance of the obligations, blockchains do not create any platform which is "*free from the reach of regulation*[70]". Blockchain-based applications are built to operate in the "real world", which is regulated by traditional legal instruments. For example, blockchain is useful for transferring property titles, however, it

[66] **BlockChannel** (March 21, 2016). What Is A "DAO"? How Do They Benefit Consumers? Available at: https://medium.com/blockchannel/what-is-a-dao-how-do-they-benefit-consumers-f7a0a862f3dc (last visit: 30.04.2018).

[67] There are some UNCITRAL works that can resolve some issues arising from the use of the blockchain technology such as such as the Model Law on Electronic Commerce, the Model Law on Electronic Signatures, the Convention on the Use of Electronic Communications in International Contracts, the Model Law on Electronic Transferable Records, the Rotterdam Rules and the Model Law on Secured Transactions. For an assessment about how they can be used in order to resolve some blockchain related legal issues, see: **Takahashi**, K. (2017). United Nations Commission on International Trade Law (ed.). Modernizing International Trade Law to Support Innovation and Sustainable Development: Implications of Blockchain Technology for the UNCITRAL Works, 81-94.

[68] **Reyes**, C. L. (2017). Conceptualizing Cryptolaw. Nebraska Law Review, 96 (2), 384-445, p. 410.

[69] This mantra is widely attributed to the Lawrence Lessig. He implies that software developers are now so-called regulators, and he puts it that way: "*If code is law, then (…) 'control of code is power*'". In: **Reyes**, p. 436; **Lessig**, L. (1999). Code: And Other Laws of Cyberspace. Basic Books; in that vein also see: **Barlow**, J. P. (1996). A Declaration of Independence of Cyberspace. Available at: https://www.eff.org/cyberspace-independence (last visit: 30.04.2018). Contra: **Farrell**, S., **Machin**, H., **Hinchliffe**, R. (2016). Lost and Found in Smart Contract Translation- Considerations in Transitioning to Automation in Legal Architecture. King & Wood Mallesons 30568170_15, pp. 4-7.

[70] **Mik**, supra note 8, p. 15; in that regard, Bitcoin blockchain core developers have already released technical standards in order to ensure that users of payment applications running on blockchain comply with the certain AML rules supervised by FinCen. **Reyes**, p. 406; "*the legal analysis will always trump the technological*" **Clifford Chance Law Firm**, p. 4; a U.S. Securities and Exchange Commission (SEC) investigation report concludes that U.S. Securities Law may apply to offers, sales and trading of interests in virtual organizations. SEC's press release about this report is available at: https://www.sec.gov/news/press-release/2017-131 (last visit: 30.04.2018); gradually, more and more states pass bills with regards to DLT and smart contracts with a purpose of regulation. See: **Kramer**, M. (April 2, 2018). Smart Contracts are Seeping into U.S Law- Tennessee Passes Bill. Available at: http://bitcoinist.com/smart-contracts-are-seeping-into-u-s-law-tennessee-passes-bill/ (last visit: 30.04.2018).

cannot provide this transfer in the physical world. Transactions are subject to current legal jurisdictions and even though controlling or imposing sanctions on the system might be very difficult, states are always capable of taking coercive measures in that regard[71]. Indeed, accurate intervention requires lawmakers to adopt an interdisciplinary approach. This is because smart contracts are a junction point of law (questions on contractual obligations), economics (market places, unidentified commercial organizations and new payment structures, i.e. cryptocurrencies) and technology (automated dispute resolution platform and its functionality).

[71] Despite being very difficult and expensive, even in a permissionless system, centralized intervention is possible. Ethereum's hard fork as a countermovement to neutralize The DAO attack can be regarded as an example. In the same vein, it is possible for states to enact local regulations to impose limitations on software developers, device manufacturers and online intermediaries by means of establishing new monitoring and disclosure requirements in order to augment the transparency; or introducing minimum privacy standards that they shall abide by.

SECTION II

1) Private Enforcement Idea as a Self-Help Mechanism

According to the Oxford Dictionary, enforcement is "*the act of compelling observance of or compliance with a law, rule, or obligation*[72]". This process was being held complete manually for ages, based upon human discretion and finite human resources. With respect, in the context of private law, enforcement is often associated with state-sanctioned protection[73] of the parties' economic interests arising from the contractual relationship. Here is a point that coercive enforcement is always regarded as an exception. In most cases, parties voluntarily perform their obligations regarding to litigation and alternative dispute resolution (ADR) procedures.

Alongside with criticized of being inefficient in terms of resource intensity, public enforcement institutions are not always reliable, notably in the non-OECD countries[74]. There might be good reasons to avoid auspices of a public enforcement institution: an authority might be corrupt, vulnerable to external influence or may entail delays or bureaucratic inefficiencies[75]. Moreover, it is a widely observed fact that well-resourced institutional players get better results in courts vis-à-vis small players[76]. Even if the institution functions properly, public enforcement is not the best way of securing justice for a significant portion of disputes anymore, due to the inconveniences such as long standing cases, high costs, lack of expertise of courts on brand new technologies and reluctance of parties to sue someone which

[72] **Oxford English Dictionary**: Enforcement, https://en.oxforddictionaries.com/definition/enforcement(last visit: 3.3.2018); Black's Law Dictionary defines the term as "*The act or process of compelling compliance with a law, mandate, command, decree, or agreement.*" **Black's Law Dictionary** (8th edition, 2004), p. 1604; Committee of Ministers of the Council of Europe gives a meaning to enforcement as follows: "*Enforcement means the putting into effect of judicial decisions, and also other judicial or non-judicial enforceable titles in compliance with the law which compels the defendant to do, to refrain from doing or to pay what has been adjudged*." Recommendation of the Committee of Ministers to Member States on Enforcement (September 9, 2003).

[73] Under the general theory of the state, modern states' hold the legitimate monopoly of violence.

[74] **Caliess**, p. 13.

[75] **Levy**, K. E. C. (2017). Book-Smart, Not Street Smart: Blockchain-Based Smart Contracts and The Social Workings of Law. Engaging Science, Technology, and Society, 3, 1-15, p. 3.

[76] Id, p. 3.

might be caused from various reasons[77]. For instance, a huge majority of the local or cross-border B2C e-commerce disputes, do not amount to more than a few hundred dollars[78]. Another example is that, recoursing to state courts' might not be a good option for smart contract disputes, due to the lack of predictability, since the existing gaps in the regulatory frameworks, technical limitations pertaining to state enforcement[79] or judges' lack of understanding for the code. In such circumstances, direct and indirect mechanisms of self-enforcement are vital and self-help aim can be attained through the use of technology. In this regard, artificial intelligence (AI) and automation are instrumental in delivering this promise. However, to be realistic, self-enforcement cannot completely substitute public enforcement for two main reasons: First, even though parties to a contract opt not to go to the court, the threat of public enforcement creates a bargaining zone[80] for a possible settlement between

[77] Usually, consumers are reluctant to initiate a court-based action for small value transactions, due to various reasons such as lack of finance, knowledge, effective access to the legal assistance. Furthermore, handicaps are augmented by the jurisdictional and choice of law problems and enforcement issues which all increase uncertainty of the internet transaction's legal dimension. **Kapoor**, V., Dealing in the Virtual- International Arbitration's New Turf. In: **Ramaswamy**, M. P., **Riberio**, J. (ed.) (2016). Harmonising Trade Law to Enable Private Sector Regional Development. CLJP Hors Serie Volume XX, 189-206, pp. 192-193; **Edwards**, L., **Wilson**, C. (2007). Redress and Alternative Dispute Resolution in EU Cross-Border E-Commerce Transactions. International Review of Law Computers & Technology, 21(3), 315-333, p. 315.

[78] Ayelet Sela contends that traditional offline judicial and ADR fora do not offer practical solutions for e-commerce disputes for three reasons: First, since most cases are cross-border, problems arise pertaining to applicable law and enforcement of the foreign decisions. Second, low value disputes can be solved more efficiently online rather than offline in terms of costs. Third, given the large numbers of e-commerce disputes, a specialized fora can handle them effectively. **Sela**, A. (2017). The Effect of Online Technologies on Dispute Resolution System Design: Antecedents, Current Trends and Future Directions. Lewis & Clark Law Review, 21, 633-682, p. 637; for example, the disputes which eBay Dispute Resolution Center deals with have an average value of $70-100. **Del Duca**, L., **Rule**, C., **Loebl**, Z. (2012). Facilitating Expansion of Cross Border E-Commerce- Developing a Global Online Dispute Resolution System (Lessons Derived from Existing ODR Systems- Work of the United Nations Commission on International Trade Law). Penn State Journal of Law & International Affairs, 1(1), 59-85, p. 63. Available at: http://elibrary.law.psu.edu/jlia/vol1/iss1/4 (last visit: 30.04.2018).

[79] Due to the technical limitations, courts will generally not be able to actualize resolutions to disputes. Courts are not competent to dictate programmers to change an existing code. Even if courts were authorized to do that, in a usual DLT, no programmer would be able to change the code contrary to the will of the majority of anonymous international blockchain users. Therefore, blockchain-based dispute resolution mechanisms are the only feasible option for resolving smart contract disputes. See: **Kaal**, W. A., **Calcaterra**, C. (2017). Crypto Transaction Dispute Resolution.The Business Lawyer. Spring 2018 (Forthcoming). University of St. Thomas (Minnesota) Legal Studies Research Paper No.17-12, p. 41. Available at: https://ssrn.com/abstract=2992962 (last visit: 30.04.2018).

[80] Accordingly, "*bargaining in the shadow of the law*" metaphor was coined by Robert Mnookin and Lewis Kornhauser. The metaphor articulates that, despite parties' avoidance from substantive law, ADR processes operate in the shadow of the law and threat of later examination affects the parties' behaviors. For further detail,

parties, which is a desired outcome for all legal systems[81]. Second, for example, smart automobile starter interrupter can prevent any contractual breach or theft to a certain extent, however, it cannot prosecute someone who damaged your car[82]. Nevertheless, this should not undermine the importance of the self-enforcement.

Self-enforcement tools are also useful in terms of public enforcement, because without any use of automation, states can only be able to focus on priority offences but cannot ensure equal treatment to everyone, and the whole process of encompassing surveillance to punishment is costly. Partially automated systems are being used as of today and there are very successful examples such as red-light cameras or speed ticket issuing drones. Despite being costly, they even make it possible to profit from enforcement. For instance, Philadelphia earned 17 million USD from red-light camera violation fines in 2013[83] and fines paid by drivers being used to support traffic and pedestrian safety projects in Pennsylvania[84]. These cameras are able to work the whole day; neither get ill nor need medical insurance. Nevertheless, it is a matter of public policy whether perfect enforcement is desired. If the answer is no, the degree to tolerance also needs to be answered. Some can argue that at least a certain degree of human discretion is necessary for social growth and stability since a perfected system does not necessarily overlap with human's justice idea[85].

In short, self-enforcement is a concept which evolves both public and private mechanisms without substituting them. Upcoming sub-sections focus on different types of ODR as private enforcement, in order to scrutinize what smart contracts and automated dispute resolution can bring in the future.

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see: **Mnookin**, R., **Kornhauser**, L. (1979). Bargaining in the Shadow of the Law: The Case of Divorce. Yale Law Journal, 88, 950-997.

[81] **Levy**, p. 9.

[82] Id, p. 4.

[83] **Hartzog**, W., **Conti**, G., **Nelson**, J., **Shay**, L. A. (2015). Inefficiently Automated Law Enforcement. Michigan State Law Review, 1763-1796, p. 1793.

[84] Over the last 8 years, the program has funded 366 projects for $62.8 million. For details of the program: **Clift**, T. (March 1, 2018). Red-light camera fines in Philadelphia fund traffic safety near Pittsburgh. Available at: http://triblive.com/local/allegheny/13368514-74/red-light-camera-fines-in-philadelphia-fund-traffic-safety-near-pittsburgh (last visit: 30.04.2018).

[85] **Hartzog et al.**, p. 1792.

A) ODR as Private Enforcement and Some Successful Implementations in Practice

ODR can be defined as "*a means of dispute resolution; uses a third party which is not involved in the dispute, to facilitate the resolution conversation along with the use of technology itself, which has been labeled as the fourth party*.[86]" On the other hand, ODR systems are internet-based platforms which conduct an entire resolution process; from filing, to rendering an award, in an online environment[87]. Thus, software has a significant role consisting of facilitating the interactions between disputants; and the third and fourth party metaphor indicates the importance of the communication and information processing tools. In fact, some ODR systems take it a step further with functioning as both third and fourth parties to a dispute. Whilst preceding categorized in instrumental ODR systems, latter falls under principal ODR systems[88].

Private ODR showed up in order to augment trust among the online community and to encourage transactions. However, ODR without enforcement force equates ODR, which is practically non-binding. Necessity of self-enforcement has been expressly recognized by UNCITRAL. The Secretariat emphasizes this fact by stating that there is a clear value to have an embedded mechanism in dispute resolution procedure for both users and online service providers in order to provide a "*one-stop shop" for the participants*[89]. "Soft" instruments such as user reviews, trustmarks and chargebacks, might serve for the purpose of building trust and being useful for parties to find reliable counterparts. Within this direction, industry-specific

[86] **Wahab**, M. S. A., **Katsh**, E., **Rainey**, D. (eds.) (2012). Online Dispute Resolution: Theory and Practice- A Treatise on Technology and Dispute Resolution. Eleven International Publishing. Introduction, p. 1; Ethan Katsh and Janet Rifkin are two prominent scholars who published the first articles on ODR, as early as 1996. Thereafter, they published the first monograph in 2001 and in that paper, in order to conceptualize the role of the technology in ODR, they used the term, "*fourth party*". See: **Katsh**, E., **Rifkin**, J. (2001). Online Dispute Resolution: Resolving Conflicts in Cyberspace. A Wiley Company, p. 93-94.

[87] **Sela**, supra note 78, p. 644.

[88] For further explanation about the distinction, see: **Sela**, A., Can Computers Be Fair? How Automated and Human-Powered Online Dispute Resolution Affect Procedural Justice in Mediation and Arbitration (2016). Ohio State Journal on Dispute Resolution. Forthcoming. Available at: https://ssrn.com/abstract=3074311 (last visit: 30.04.2018).

[89] A/CN.9/WG.III/WP.124, para 10.

rules, best practices or self-regulation might be helpful to motive trading behaviors[90]. However, all of these methods are inadequate to force compliance in individual cases, thus, can be used as ancillary rather than primary.

Until today, the main purpose of these services was to keep apart low value disputes from traditional judicial systems[91]. Some commentators argue that ODR systems are only justified for low-value disputes, especially with the current technology, contending that cyberspace is not the mirror image of the real world[92]. There are some significant concerns such as financial concerns (funding to develop unbiased systems), regulatory concerns (lack of legal framework which will ensure procedural quality), institutional concerns (resistance to maintain *status qua)*, ethical concerns (can software render real justice?) and personal concerns (everyone is not tech-savvy)[93]. However, advancements in AI, big data technologies, machine learning, virtual meeting rooms and affective computing, will all contribute to attaining the vision of effective access to justice in terms of much broader classes of disputes[94]. In addition, potentials are not limited to ADR, some states are also working on projects to utilize technology, in order to make its judicial system more effective[95].

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[90] **Koulu**, supra note 14, p. 303.

[91] **Piers**, M., **Aschauer**, C. (2018). Arbitration in the Digital Age: The Brave New World of Arbitration. Cambridge University Press, in the foreword, p. x.

[92] **Betancourt**, J. C., **Zlatanska**, E. (2013). Online Dispute Resolution (ODR): What Is It, and Is It the Way Forward? International Journal of Arbitration, Mediation and Dispute Management, 79 (3), 256-264, p. 263 (*…In terms of the appropriateness of online arbitration, it has been said that it is "particularly appropriate with respect to simple fact patterns and small claims". Hence, online arbitration may appeal to the users of small claims and documents-only arbitration schemes, but definitely not to the users of "international arbitration", where complex issues and large amounts of money are at stake*).

[93] **Sela**, supra note 78, p. 671.

[94] **UK Civil Justice Council** (2015). Online Dispute Resolution Advisory Group, Online Dispute Resolution For Low Value Civil Claims, p. 24. Available at: https://www.judiciary.gov.uk/wp-content/uploads/2015/02/Online-Dispute-Resolution-Final-Web-Version1.pdf (last visited: 30.04.2018).

[95] In England and Wales, a platform called "Money Claim Online" settles disputes arising from fixed sum claims up to £100,000, and the ODR system of the "Traffic Penalty Tribunal" hear the majority of its appeal cases exclusively online. See: https://www.moneyclaim.gov.uk/ (last visit: 5.3.2018), https://www.trafficpenaltytribunal.gov.uk (last visit: 5.3.2018); in the Canadian District of British Columbia, the Civil Resolution Tribunal was established in 2011 by law, as a part of the country's civil justice reform. It is a court connected ODR program which deals with the small claims (up to 25.000 Canadian Dollars) related to property and traffic disputes. For details, see: **Sela**, supra note 78, p. 656.

ODR systems exist in different structures and serve different purposes by using a wide array of online procedures and technical tools. Services are being provided by diversified intermediaries such as e-commerce platforms, credit card companies, private ODR providers etc. In the upcoming subsections, we are going to discuss two prominent ODR systems, which are emerged as autonomous non-state legal systems imitating structures of the state litigation[96]: eBay Resolution Center and The Internet Corporation for Assigned Names and Numbers (ICANN).

a) eBay Dispute Resolution Center

eBay is a renowned multinational corporation and a marketplace facilitating C2C (customer-to-customer) and B2C sales through its website. Importantly, it has access to PayPal, the world's largest internet payment company[97]. As the other centralized e-commerce platforms (Amazon, Etsy etc.), eBay has a dispute resolution service to reduce fraud and scams. As selling billions of items per year and having a higher daily trade volume than NASDAQ[98], eBay has to deal with more than 60 million disputes per year[99]. Moreover, these disputes possess various characteristics and complexities. Payment disputes are maybe the simplest ones. eBay also has to settle disputes concerning item quality, reputation (feedback disputes) and intellectual property rights[100]. Due to the impossibility of employment of sufficient staff, to handle all of these issues both economically and operationally, automation is a must under such circumstances.

To cater its user's need, besides adopting "soft" instruments, to build trust such as user reviews, eBay developed a service that resolves e-commerce disputes by means of a

[96] **Koulu**, supra note 14, p. 84.

[97] PayPal operated as a subsidiary of eBay between 2002-2015. However, companies decided to operate independently. About impacts of this separation: **Duryee**, T. (July 1, 2015). Everything you need to know about eBay and PayPal's split- and how it impacts Amazon. Available at: https://www.geekwire.com/2015/everything-you-need-to-know-about-ebay-and-paypals-split-and-how-it-impacts-amazon/ (last visit: 30.04.2018).

[98] **Rule**, C. (2017). Designing a Global Online Dispute Resolution Systems: Lessons Learned from eBay. University of St. Thomas Law Journal, 13(2), 354-369, p. 354.

[99] Id, p. 354.

[100] **Schmitz**, A. J., **Rule**, C. (2018). The New Handshake: Online Dispute Resolution and the Future of Consumer Protection. University of Missouri School of Law. Legal Studies Research Paper Series Research Paper No. 2018-08, p. 35. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3106913 (last visit: 30.04.2018).

"*software-powered, asynchronous, text-based negotiation-mediation process, followed, if needed, by human powered arbitration*[101]". eBay is often touted as a success story of ODR[102], as more than 90% of the disputes are resolved without intervention of a third party[103]. The hallmark of this success is the decision-tree which is derived from patterns of user behaviors on how disputes emerge and resolve. Thanks to the machine learning, which gives a familiarity to spectrum of disputes and is fed by huge number of transactions, the algorithm helps buyers and sellers to diagnose a real problem and assists them to find a feasible solution[104]. If parties cannot reach to an agreement, a neutral, authorized by eBay, takes part in the process and resolves the dispute. Notwithstanding that this big-data approach raises some concerns about bias, further examination of transaction records and dispute outcomes is needed to ascertain its real efficiency.

Last but not least, self-enforcement is an essential part of the eBay's dispute resolution mechanism. The user agreement, which is binding upon all participants of the marketplace, grants eBay to request PayPal to restrict seller's control on his/her PayPal account "*based on certain factors, including but not limited to, selling history, seller performance, returns, riskiness of the listing category, transaction value, or the filing of an eBay Money Back Guarantee case*[105]". Furthermore, the user agreement ensures that both the parties accept that eBay's decision on the Money Back Guarantee is final. Ultimately, this enforcement mechanism provided by cooperation between eBay and PayPal creates an undeniably economic system that provides an environment which consumer trust is protected[106].

b) The Internet Corporation for Assigned Names and Numbers (ICANN)

[101] **Sela**, supra note 78, p. 646.

[102] **Koulu**, supra note 14, p. 119.

[103] **Raymond**, A. H., **Shackelford**, S. J. (2014). Technology, Ethics, and Access to Justice: Should an Algorithm Be Deciding Your Case? Michigan Journal of International Law, 35 (3), 485-524, p. 492. Available at: https://repository.law.umich.edu/mjil/vol35/iss3/1/ (last visit: 30.04.2018).

[104] This process resembles a guided negation/mediation.

[105] http://pages.ebay.com/help/policies/user-agreement.html (last visit: 30.04.2018). Revised version is effective for all users as of March 30, 2018.

[106] **Koulu**, supra note 14, p. 149.

ICANN is a textbook example of an ODR mechanism, utilizing technology in order to attain the purpose of self-enforcement. The absolute amount of the top level domain ownership disputes[107] are solved via application of the Uniform Domain Name Dispute Resolution Policy [108](UDRP), rules established by the institution itself in cooperation with the World Intellectual Property Organization (WIPO). Accredited institutions [109] conduct mandatory administrative proceedings provided by the UDRP in order to settle disputes. ICANN enforces accredited institutions' decisions simply by matching up the domain name with the IP address of the prevailing party[110]. That is to say, the remedies are mainly limited to the cancellation or change of an unlawful registered name[111].

During the proceedings or after the conclusion, both parties are free to initiate court proceedings. However, in the absence of such initiation document shown in 10 days subsequent to the decision, ICANN shall implement the decision[112]. Therefore, it would not be wrong to infer that ICANN enjoys a monopoly on use of force for domain disputes, in a similar way how nation-states' use their monopoly on violence in the real world[113]. In that sense, ICANN is a private actor performing public function. Moreover, it is a good role model for unidimensional online disputes. However, to ensure legitimacy, it is important to ensure

[107] All disputes about domain names terminating with .com, .net or .org are globally subject to the UDRP, regardless of the parties' residency or place where the domain is registered in.

[108] https://www.icann.org/resources/pages/help/dndr/udrp-en (last visit: 30.04.2018). The policy stipulates substantive rules for domain disputes, whilst the Rules for Uniform Domain Name Dispute Resolution Policy designates procedure rules before arbitral tribunals. Rules are adopted on 24 October, 1999.

[109] At the time being, these institutions are Asian Domain Name Centre, National Arbitration Forum, WIPO, The Czech Arbitration Court Arbitration Center for Internet Disputes, and Arab Center for Domain Name Dispute Resolution. https://www.icann.org/resources/pages/providers-6d-2012-02-25-en (last visit: 5.3.2018).

[110] ICANN UDRP (n 45) para 3(1)(c); **Ortolani**, p. 604.

[111] **Duca (et al.)**, p. 67.

[112] UDRP, Article 4.K.

[113] **Ortiz**, A. L. (2005). Arbitration and IT. Arbitration International, 21 (3), 343-360, p. 349.

due process; and ICANN has been criticized within this context as well as lack of monitoring over private corporations[114].

B) Automated Online Dispute Resolution (AODR) as a Means of Private Enforcement: Smart Contracts with Embedded Dispute Resolution

Despite the fact that the abovementioned mechanisms are thriven examples of ODR, both of eBay and ICANN model have important drawbacks that impede their widespread use. To make it clear, eBay model requires an interface with a payment method, which is only accessible by market leaders[115]. When it comes to ICANN, the mechanism can only be imitated for uncomplicated online disputes, as for how the domain disputes are. In addition, parties reserve their rights to relitigate before the competent state courts, which undermine the efficiency of private enforcement. Moreover, both mechanisms raise concerns about fairness and due process, resulting from lack of state monitoring over decisions. Under these circumstances, smart contracts might bring a new facilitating perspective on both dispute resolution and conflict prevention.

Theoretically, at least *prima facie*, smart contracts can respond to these drawbacks: the DLT interface with virtual currency payment method is accessible for nearly everyone and tamper-proof execution contends to eliminate any need for human intervention[116]. However, in reality, the necessity of a dispute resolution mechanism remains for several reasons. First, to ensure such a tamper-proof execution, smart contract's code must be free from any bug (coding error). In other words, the code must be flawless, which is practically impossible to guarantee[117]. A lab research outcome shows that even encoding a simple game such as *'Rock,*

[114] **Koulu**, supra note 14, p. 30; For a detailed analysis on failures of the ICANN: **Thornburg**, E. G. (2002). Fast, Cheap, and Out of Control: Lessons from the ICANN Dispute Resolution Process. The Journal of Small & Emerging Business Law, 6, 191-233.

[115] **Koulu**, A. R. (2016). ' Blockchains and Online Dispute Resolution: Smart Contracts as an Alternative to Enforcement' SCRIPTed - A Journal of Law, Technology & Society, 13 (1), 40-69, p. 47.

[116] Id, p. 48; Savelyev explains smarts contracts' by asserting that: "*Smart contracts are meant to be stand-alone agreements– not subject to interpretation by outside entities or jurisdictions. The code itself is meant to be the ultimate arbiter of 'the deal' it represents.*" See: **Savalyev**, p. 14.

[117] **Mik**, supra note 8, p. 11.

Paper and Scissors' into a smart contract is nontrivial[118]. Second, even if coders might be able to bridge the gap between legal prose and computer language, factors such as incomplete foresight or incomplete information may give rise to disputes[119]. This is a genuine problem for particularly long-term contracts, where parties have to anticipate all possible events during the contract's lifetime in order to be able to conclude an immutable, tamper-proof contract. Discrepantly, life is full of surprises[120] and that is the reason why principles of *pacta sunt servanda* and *rebus sic stantibus* exist at the same time. Moreover, a basic law amendment might easily make a valid smart contract illegal. This means that in the absence of an alter or undo mechanism, a smart contract would enforce itself at all costs, even contrary to the will of the parties' or the state authorities'. The same goes for in the case of duress, deceit or unconscionability. Notwithstanding that, fortunately, there are at least a few means for modifying a smart contract if it is coded wisely[121]. Yet, traditional contract law tools fail for smart contracts and it is necessary to develop new set of standards. The upshot is that parties will still need traditional legal protection[122] and establishing standards for altering; and undoing smart contracts is an important duty for programmers in that sense.

When smart contracts are scrutinized under the current legal framework, there are some controversial issues which makes harder to apply such protective measures. A party might object that a smart contract is not in fact legally binding, contest governing law or

[118] **Delmolino**, K. (et al.) (2015). Step by Step Towards Creating a Safe Smart Contract: Lessons and Insights from a Cryptocurrency Lab, p. 2. Available at: https://eprint.iacr.org/2015/460.pdf (last visit: 5.3.2018); Authors' conclusion is that "*economic thinking*" is essential for smart contract coding and it is a kind of merit that traditional programmers may not have acquired.

[119] **Kaal**, **Calcaterra**, p. 46-47.

[120] *"… As performance unfolds, circumstances change, often unforeseeably; the explicit terms of the contract become progressively less apt to the governance of the parties' relationship*" Such external events might degrade the value of the smart contracts in the sight of the parties. **Posner**, R. A. (2009). Let Us Never Blame a Contract Breaker. Michigan Law Review, 107, 1349-1364, p.1360; *"...if not properly designed, regulation by code might actually oppose the interest of the individual it is meant to regulate.*" **Filippi**, **Hassan**, supra note 9.

[121] When a contract is added on a block, its code becomes immutable. However, the contract's state is not immutable. Nodes participating in the Ethereum's network not only can add transactions to the ledger, but could also run and adjust contract states in the Ethereum Virtual Machine. In that regard, there are at least two means to undo contracts on Ethereum, using self-destruct and using modifiers and enums. On the other hand, for the alteration, there are at least three possibilities, i.e. modification of variable-captured terms, deletion of function-captured terms and addition or alteration of function-captured terms. **Marino**, **Juels**, pp. 159-166.

[122] **O'Shields**, R. (2017). Smart Contracts: Legal Agreements for the Blockchain. North Carolina Banking Institute, 21 (1), 177-194, p. 190.

jurisdiction. Bearing in mind that there is no central enforcement agency or an established precedent, it is highly advisable for parties to include a dispute resolution or an arbitration clause before concluding a smart contract[123]. Embedded dispute resolutions mechanisms are also essential for the decentralized market service providers; in most cases, due to the anonymity, a litigant who wants performance from the other party would not be able to find anyone to sue[124].

Even though it is nearly impossible to make a retroactive transaction on blockchain computationally[125], building some flexibility is technically possible. Enforcement might be structured in a way which allows arbitration. Owing to the multi-signature transaction infrastructure (also called as multi-sig), multiple people can control the same Bitcoin (or whatever cryptocurrency is being used), despite only one person who controls the coins in a certain account[126]. In order to transfer these coins to another account, a certain amount of people must provide its private key to activate the transaction. For example, when it comes to a 2-of-3 address, which means that three people[127] have control on the account but at least two of them must agree before the funds can be spent, if no dispute arises, the transaction will consummate with the buyer and seller's signature. However, if either party refuses to provide its private key for any reason, the arbitrator's signature determines the outcome[128]. The underlying rationale of some of the current crypto transaction dispute resolution mechanisms such as Aragon[129] and OpenBazaar[130] is the same.

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[123] **Sherborne**, p. 6.

[124] **Werbach**, **Cornell**, p. 332.

[125] **Kaal**, **Calcaterra**, p. 41.

[126] **Patterson**, S. (February 24, 2016). How Moderators and Dispute Resolution Works in OpenBazaar. Available at: https://www.openbazaar.org/blog/how-moderators-and-dispute-resolution-work-in-openbazaar/ (last visit: 30.4.2018).

[127] Typically, parties consist of a buyer, a seller and a trusted third party which acts as an arbitrator in our case.

[128] **Ortolani**, p. 610.

[129] According to its whitepaper, Aragon network provides a "*decentralized, liquid, forkable jurisdiction*" and defines a set of contracts to as that they "*provide arbitration for any given dispute between two parties*" See: **Cuende**, L., **Izguerdo**, J. (April 20, 2017). Aragon Network: A Decentralized Infrastructure For Value Exchange. Available at: https://github.com/aragon/whitepaper/blob/master/Aragon%20Whitepaper.pdf (last visit: 30.4.2018).

In conclusion, since smart contracts would not ensure perfect performance or direct enforcement, the necessity of a dispute resolution mechanism remains. Due to its unprecedented characteristics, blockchain based dispute resolution (also called as Bitcoin adjudication) is not just a sort of ODR or online form of the international arbitration; instead, it can be regarded to as an entirely new and autonomous dispute resolution mechanism[131].

2) The Blockchain-Based Self-Enforcement Model in Comparison to Some Other Models

In order to shed a light on this new model, we are going to scrutinize it comparatively with two other direct self-enforcement mechanisms addressed by UNCITRAL Working Group III on Online Dispute Resolution; the escrow based model and the chargeback based model[132]. Notwithstanding that the utility or appropriateness of these mechanisms change on a case-by-case basis, they have one thing in common: these mechanisms largely rely on the third parties or the market place. ODR service providers or payment intermediaries control the payment flows of a transaction. In this context, exclusively being a peer-to-peer system, blockchain based mechanisms provide innovative and radically alternative structures of self-enforcement which is not comparable to the other mechanisms which we have mentioned so far.

A) Escrow Based Model

Escrow is a legal concept in which a financial instrument or an asset is held by a third party (escrow agent) on behalf of the payer and the payee that are in the process of completing a transaction. The aim is to enable parties to move forward only if it is ensured that the other party will be able to fulfill its obligations. Upon the confirmation stating that the payee has

[130] Even though it does not use a blockchain, OpenBazaar is a Kademlia-style Peer-to-Peer (P2P) network providing an online market platform for any type of commodity using cryptocurrencies. See: OpenBazaar Protocol: http://docs.openbazaar.org/03.-OpenBazaar-Protocol (last visit: 30.4.2018).

[131] **Ortolani**, p. 611; this alternative mechanism might be implemented in two different ways depending on the parties' will: the stateless-currency-based model and the credit card preauthorization-based model.

[132] A/CN.9/WG.III/WP.124.

performed its side of duty, the payer permits the escrow agent to release funds to the payee[133]. The agent is subject to the national legislation and licensing rules[134].

The traditional escrow service can be adapted to make payment in fiat currencies. In fact, Nakamoto makes a reference in Bitcoin's white paper, articulating that, "*routine escrow mechanisms could easily be implemented to protect buyers*[135]". In parallel with that, the underlying rationale of the multi-sig transactions are same with the escrow agreements, due to the fact that they allow freezing Bitcoins into a third party node (address) until predetermined number of users sign the transaction[136]. The third party is also being called an "arbitrator" because in the absence of a dispute, funds can autonomously be unlocked by the parties. Therefore, the third parties role only matters if a dispute arises. In addition, differently from the escrow accounts, the third party does not hold the funds at any moment, and as a consequence, it is not entitled to unlock the funds on its own motion[137]. In the Bitcoin escrow, the Bitcoins are stored in the ODR service provider's wallet and are subject to final decision, which the service provider sends the money to the party who is entitled. The upshot is that a third party (so called "arbitrator") in the blockchain based model is not an equivalent of a traditional escrow agent and smart contracts may mimic escrow-like mechanisms but do not constitute the traditional escrow itself[138].

Notwithstanding that a reliable escrow service may protect a purchaser from fraudulent merchants, there is always a risk of encountering with malicious escrow services which are set up by rogue merchants in order to resemble legitimate services. The reason is that the escrow agreement requires the buyer to deposit funds to the agent's account in advance of the seller's performance. Even if the escrow agent does not misappropriate the funds, a third party may steal it or basically, an escrow agent may just go bankrupt. As a rule

[133] **Takahashi**, K. (2018). Blockchain Technology for Letters of Credit and Escrow Arrangements. The Banking Law Journal, 135 (2), 89-104, p. 97.

[134] Supra note 132, para. 41.

[135] **Nakamoto**, p. 1.

[136] **Cuccuru**, p. 183.

[137] Id, p. 183.

[138] **Werbach**, **Cornell**, p. 345.

of thumb, bankruptcy means that funds will constitute property of the bankruptcy estate unless otherwise provided under the applicable law[139]. In overall, these risks are potent and they constitute an important reason for why the letter of credit is the prominent payment method instead of an escrow agreement when a large sum of money is at stake[140]. In an effort to enhance reliability, states impose licensing and other regulatory requirements on the escrow service providers[141]. Indeed, this increases the legal compliance costs. In addition, even in the absence of a dispute, two transactions are needed in any case, and this feature comprises a basis for proportionally high transaction costs for low value transactions. At this point, the blockchain technology, owing to the multi-sig mechanism, might be a good alternative to reduce the aforementioned risks and costs[142].

With the implementation of a 2-of-3 multi-sig mechanism, which can be seen in practice (such as the OpenBazaar example), the risk of a third party theft will reduce considerably. The reason is that signatures of multiple parties are required to release the deposited funds. More importantly, the threat of a misappropriation by the escrow agent is totally removed since the agent itself cannot be able to release the funds on its own motion. On the other hand, the risk of collusion between the escrow agent and the buyer or the seller still continues. Nevertheless, when an escrow agreement is fortified with the multi-sig, the required trust threshold diminishes. Thus, easing the regulatory requirements for the escrow

[139] **Takahashi**, supra note 133, p. 98.

[140] Id, p. 98.

[141] For example, pursuant to the Washington's Escrow Agent Registration Act, escrow services are required to be certified by the Department of Financial Institutions. Before obtaining the certificate, *"(...) a company must pay a fee and its sole proprietor, partner or corporate officer pass a state examination and submit three affidavits of good character, proof of good credit, and a fidelity bond"*. There are some further restrictions in terms of the recording of transactions and the usage of the funds. The violation of these terms would entitle the Director of the Department of Licensing to temporarily suspend or permanently revoke the license. Similar regulations also exist in other jurisdictions. **Tonnon**, A. (2005). Washington Real Estate Law. Rockwell Publishing. 4th edition, p. 320; Takahashi contends that such regulations may also be applicable where the escrow agent receives a cryptocurrency. **Takahashi**, supra note 133, p. 98, footnote 22.

[142] For example, the ABN AMRO, one of the four biggest Dutch banks, has launched a new service wherein ban k accounts are issued to individual clients via blockchain, as an alternative to escrow accounts. The bank asserts that this praxis will dramatically cut organizations' administrative costs by eliminating escrow account management costs. **Das**, S. (February 17, 2018). ABN AMRO Launches Blockchain Bank Accounts to Kill Escrow Accounts. Available at: https://www.ccn.com/abn-amro-launches-blockchain-bank-accounts-kill-escrow-accounts/ (last visit: 30.4.2018).

services might be justified in the grand scheme of things[143]. Finally, yet, one should not overlook the fact that blockchain escrow is a totally deregulated online dispute settlement mechanism and therefore, legal certainty and due process cannot be guaranteed[144].

B) Chargeback Based Model

A chargeback is a self-enforcement mechanism which can be defined as a "*charge that is returned to a payment card after a customer successfully disputes an item on his account transactions report*[145]". Chargebacks are mainly being used as a consumer protection tool and the scope of it differs from jurisdiction to jurisdiction and amongst different payment intermediaries[146]. Under some particular national legislations, the purchaser is entitled to obtain a chargeback only if he or she has been defrauded by the merchant. However, other jurisdictions expand the scope by including instances such as non-performance or defective performance[147]. At first appearance, chargebacks resemble traditional refunds, yet, there is a significant difference: rather than communicating with business for a refund, the purchaser is directly asking the bank to transfer the money from the business's account. If the bank decides that this is a legitimate request, not only the card holder's money is reversed but also the customer is in no way obliged to return the merchandise. Unlike the escrow based model, chargebacks do not cut the payment flow in any way, which can be seen as a significant advantage for some certain business sectors.

On the other hand, if we put the drawbacks of the chargebacks on the table, costs constitute a big concern. The structure is underpinned by two transfers of funds: from the

[143] **Takahashi**, supra note 133, p. 100.

[144] **Ortolani**, p. 610; such concerns arise mainly due to the lack of legal expertise rather than the technological reasons. Arbitrators do not have a clear indication as to which substantive and procedural rules shall follow.

[145] https://www.investopedia.com/terms/c/chargeback.asp (last visit: 30.4.2018).

[146] See: Chargeback Management Guidelines for Visa Merchants, section 3. Available at: https://usa.visa.com/dam/VCOM/download/merchants/chargeback-management-guidelines-for-visa-merchants.pdf; MasterCard Chargeback Guide (January 16, 2018). Available at: https://www.mastercard.us/content/dam/mccom/en-us/.../chargeback-guide.pdf (last visit: 30.4.2018).

[147] In general, the four most common chargeback reasons are enumerated as follows: a) non-delivery, b) delivery of non-conforming goods or services, c) charges after cancellation of a recurring transaction, and d) duplicate processing of a single transaction. See: **Del Duca (et al.)**, pp. 71-72.

buyer to the seller and subsequently, *vice versa*. Furthermore, in lieu of every chargeback request, the seller is required to pay a fee[148]. This is a significant deterrent to adopt the chargeback mechanism, particularly given the average low value of e-commerce transactions. In the same vein, chargebacks affect merchants' credit score in a negative manner. The more self-enforcement is provided by the chargeback mechanism, the higher the fees the merchant will be charged for each transaction[149]. The buyer's financial interests are not always fully protected either, due to the fact that a buyer cannot claim for its excessive damages via filing a chargeback request. The buyer can only get the amount which is paid in the first place[150].

Last but one, as we discussed earlier, collusion between an escrow service provider and one of the parties to the multi-sig transaction is always possible and is a drawback for the entire mechanism. However, prevalence of such collusion is not as frequent as a "*friendly fraud*[151]" situation which happens in case of a chargeback request. The Visa study showed that the cost of a friendly fraud to merchants was $11.8 billion in 2012[152]. More importantly, a friendly fraud has the potential to take the merchants out of the business. Merchants, with more than 1% charges being reversed, can lose the ability to use credit cards as a payment

[148] **Sorkin**, D. E. (2001). Payment Methods for Consumer-to-Consumer Online Transactions. Akron Law Review, 35, 1-30, p. 9.

[149] **Ortolani**, p. 618.

[150] **Del Luca (et al.)**, p. 72.

[151] A "friendly fraud" describes a situation in which a customer who makes an internet transaction via his or her credit card, in defiance of receiving the goods or services, initiates a chargeback procedure through the card provider. The purpose of the customer is to reduce the balance on their credit card but nevertheless, to use or keep the product. In many cases, customers claim that they never received the merchandise or they received a defective one. Another common method is claiming that they never authorized the order. It is not very easy to investigate and prosecute such claims, due to the fact that in the law enforcement's point of view, a credit card fraud is a victimless crime. Notwithstanding that there are ways to struggle with it, this is a paramount vulnerability for the merchants. See: **Lake**, P., **Behling**, S. (2010). E-Businesses at Risk: A Look at the Impact and Control of E-Business Fraud. Issues in Information Systems, 11 (1), 280-285, p. 281.

[152] **Consumers Council of Canada** (2017). Consumer Redress, Chargebacks and Merchant Responses in Distant Transactions, p. 51. Available at: https://www.consumerscouncil.com/site/consumers_council_of_canada/assets/pdf/809268-ccc-chargebacks-report-pdf-en-web.pdf (last visit: 30.4.2018); also a study of Lexis Nexis ascertains that a chargeback fraud costs merchants $2.40 for every $1 loss, due to the product loss, banking fines, administrative costs and penalties. See: **LexisNexis®** (2016). True Cost of Fraud[SM] Study: Remote Channels Continue to Get Hit Hard by Fraud; a Multi-Layered Approach Can Help. Annual Report, p. 7.

method[153]. When it is taken into account together with the studies which state that 86% of the time, customers do not contact with the merchant until a chargeback is filed, or at all, it is hard for the merchants to take measures to prevent such claims[154] and defend themselves vis-à-vis customers.

The bottom line is that blockchain adjudication can take to the stage as a good alternative and replace chargebacks to a large extent as a dispute resolution mechanism in the long run. In a blockchain based dispute resolution proceeding, the customers would be able to claim for excessive damages if the merchant has sufficient amount of funds to cover the damages in its wallet. On the other hand, on the merchant's side, the total amount of friendly fraud will reduce, especially pertaining to the non-delivery claims, owing to the oracles and expert arbitrators. For sure, it is only a prediction since further experiments are needed to evaluate the results; however, by all manner of means, "*the future development of ODR would clearly benefit from the creation of a plurality of mechanisms of direct self-enforcement*[155]".

[153] **Harper**, E. (March 11, 2014). Friendly Fraud? Yes It Exists. Available at: https://www.csmonitor.com/Business/Saving-Money/2014/0311/Friendly-fraud-Yes-it-exists (last visit: 30.4.2018).

[154] **Verifi Inc**. (2014). What Every Card Not Present Merchant Should Know: Navigating Today's Challenging Payments Ecosystem, p. 38. Available at: https://www.verifi.com/wp-content/uploads/2014/05/Verifi_eBook_web_noCNP.pdf (last visit: 30.4.2018).

[155] **Ortolani**, p. 629.

SECTION III

1) Smart Contracts as Legal Contracts

In the simplest term, a contract is a legally enforceable promise or promises[156]. Thus, it would not be wrong to state that notion of enforceability is the core of the contract law. This is because enforceability makes the distinction between personal agreements, i.e. between friends, e.g. to meet somewhere at a particular time, and contracts which are subject to the legal remedies upon court orders. If the same legal remedies apply to smart contracts, they have to meet all of the traditional requirements of the contract law theory[157]. Notwithstanding the fact that smart contracts were designed as a tool to provide self-enforcement without requiring any human intervention, in order to become a commercially viable tool, smart contracts should be both technically and legally enforceable[158]. The final arbiter is always the courts when it comes to legal effects of any concept. The bottom line is that smart contracts cannot replace the contract law or aim to do so[159]. They aim to ensure performance *ex ante*, rather than dealing with grievances that may arise *ex post*. Nonetheless, even though smart contracts are not intended to be legally valid or enforceable by the court, it does not mean that they are neither invalid nor parties intend them to be unenforceable if a dispute reaches to the courtroom.

Just as the online contracts, smart contracts are a new method of contract formation; rather than being a new type of contract[160]. Notwithstanding that, an important feature discerns smart contracts from the traditional contracts. Whereas a traditional contract is an inert text[161] and performance of it is up to the parties' will, which means that parties might opt

[156] Restatement (Second) of the Contracts (1981), § 1, The American Law Institute.

[157] **O'Shields**, p. 186.

[158] **Mik**, supra note 8, p. 13.

[159] "*At best, smart contracts might reduce the need for contract litigation*". **Werbach**, **Cornell**, p. 363; smart contracts do not substitute legal contracts. However, they can be an alternative solution when the legal contracts seem to be impractical in specific circumstances.

[160] **Inal**, E. (2005). E-ticaret Hukukundaki Gelişmeler ve İnternette Sözleşmelerin Kurulması. Vedat Kitapçılık, p. 33.

[161] Alternatively, sometimes it can be comprised of merely an oral communication.

to an efficient breach[162] at the end, conversely, smart contracts are at least partially performed by computers, without leaving any room for an intervention or breach. Therefore, contrary to the pre-existing contract forms, the digital code is not a representation of an agreement; but it is the agreement itself[163]. Tamper-proof execution blurs the line between executory and executed contracts and creates a grey area: smart contracts do not transfer an asset or title at the conclusion of the contract. However, without detriment to committing something in the future, the parties do not exactly make a promise. Performance depends only on the operation of an "if-then" mechanism rather than the further action of the parties, since the entire life of the contract is embedded.

In addition to the aforementioned features, smart contracts introduce novel phenomena such as DAOs and "follow-on" agreements which are made entirely by machines and are not recognized as legal persons under traditional legal frameworks. At present time, this uncertainty drags legal scholars into a discussion on determining whether and how smart contracts should be regulated[164]. In the same vein, when the international architecture of blockchain systems are taken into account, there is also an ongoing discussion on whether a globally unified solution is needed or not.

In spite of the fact that traditional jurisdictional tools have limited applicability in the context of blockchain technology, existing legal principles are still applicable[165]. Contract law

[162] An efficient breach is a recognized notion under the legal and economic theory and allows a party to breach a contract on a condition where he or she shall pay the relevant damages if it is more efficient than performance in an economical point of way. For further information, see: **Klass**, G., Efficient Breach, pp.362-387 In: **Klass** G., **Letsas**, G., **Saprai**, P. (eds.) (2014). The Philosophical Foundations of Contract Law. Oxford University Press.

[163] **Werbach**, **Cornell**, p. 344.

[164] **Reyes**, p. 399.

[165] "*It is axiomatic that normal contractual principles apply*". Chwee Kin Keong and Others v Digilandmail.com Pte Ltd [2005] 2 LRC 28 at paragraph 102 (High Court, Singapore), In: An R3 and Norton Rose Fulbright White Paper: Can Smart Contracts Be Legally Binding Contracts? (November 21, 2016), p. 15. Available at: http://www.nortonrosefulbright.com/files/r3-and-norton-rose-fulbright-white-paper-full-report-144581.pdf (last visit: 30.4.2018); "*It seems clear from the adaptation of legal principles to electronic transactions that smart contracts will not require any special set of new laws or regulations*." **O'Shields**, p. 189; "*These conditions apply to a written, spoken, and even encrypted agreements*". **Arifi**, B. J. (November 21, 2017). Preparing Ahead for Smart Contracts. The Jakarta Post. Available at: http://bahar.co.id/whats-new/whats-new/preparing-ahead-smart-contracts (last visit: 30.4.2018); "*Existing frameworks for legal contracts apply to smart contracts.*" **Chamber of Digital Commerce** (January 2, 2018). "Smart Contracts" Legal Primer: Why Smart Contracts Are Valid under Existing Law and Do Not Require Additional Authorization to Be Enforceable, p. 2. Available at: https://digitalchamber.org/wp-content/uploads/2018/02/Smart-Contracts-Legal-Primer-02.01.2018.pdf (last visit: 30.4.2018).

is sufficiently flexible to interpret new concepts regardless of complication, without needing major changes. In that regard, problems arising from electronic communication have a considerable history: technologies such as Electronic Data Interchange (EDI) have been used in business since the 1970's[166]. Thus, when analyzing smart contracts in the context of the contract law, it must be taken into account that, "*new methods of communicating do not imply a need to create new principles or a parallel regime to accommodate online contracting*[167]".

At this point, we would like to remind that smart contracts lie on a very broad spectrum which makes it difficult to make a general interpretation with regards to the formation as a binding contract. In the two extremes, a contract might be written entirely in code, or automation shall only be used as a payment mechanism whilst the parties use a natural language contract. The middle of-the-road approaches also exist in the same spectrum; such as, using a contract in code with a duplicated human language version or a "*split*" contract with encoded performance of non-human aspects. Moreover, contracts which are directly initiated by the parties, and "*follow-on*" contracts which are formed by the performance of the smart contract itself, shall be subject to different legal evaluations. The more technology advances, the more complex smart contract structures proliferate. Therefore, we predict a future evolution as follows:

[166] EDI is a contracting technology from the 1970's, aiming to eliminate the inefficiency of traditional paper contracts; which resembles the aim of smart contracts. At that time, master minds imagined a revolution for the transaction methods and envisaged a full shift away from the paper-based world. Eventually, it failed to attain these goals for some reason, which are out of the scope of this paper. Indeed, DLT is technically more sophisticated than EDI, owing to its programming languages which offer broad range of applications in a bigger scale. For further information and comparison: **Sklaroff**, J. M. (2017). Smart Contracts and the Cost of Inflexibility. University of Pennsylvania Law Review, 166, 263-303.

[167] **Furmston**, M. P., **Tolhurst**, G. J. (2010). Contract Formation: Law and Practice. Oxford University Press, p. 160.

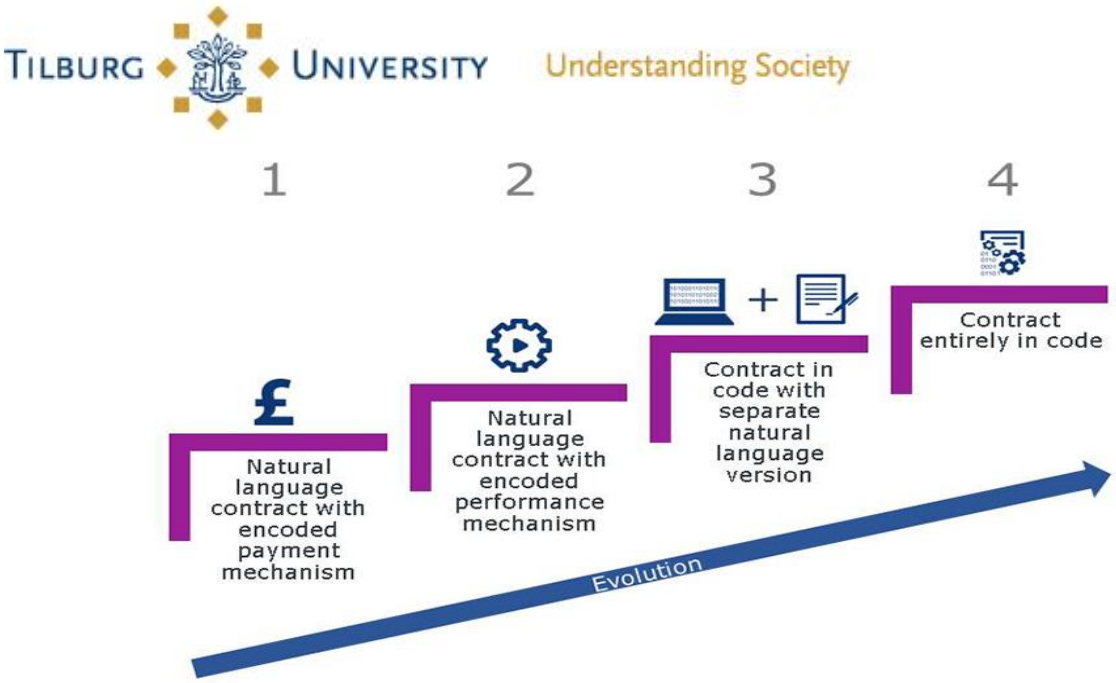

Figure I[168]- Possible Evolution of Smart Contracts

The upshot is that the term "smart contract" is misleading due to the fact that several different types exist practically and they all use the same terminology. Therefore, general interpretations related to the contract law theory might be misleading in some cases and therefore, a case-by-case evaluation is always needed in order to draw an accurate conclusion[169].

In the following sub-sections, we are going to examine the formation of smart contracts and at the same time, we are going to seek answers for whether smart contracts are legally binding contracts under the traditional contract law principles and whether there is need for a globally unified solution. With this purpose in mind, first, we are going to establish a connection between smart contracts and prevalent legal concepts, such as offer and acceptance (declaration of intent), consideration, legal capacity and remedies. Second, we are going to scrutinize formation of the smart contracts in the context of two renowned legal instruments which are being used thoroughly in commercial contracts and in the international commercial arbitration practice: United Nations Convention on Contracts for the International

[168] The figure is taken from: **Ashurts LLP** (March 1, 2018). Smart Contract- Can Code Ever Be Law? Available at: https://www.ashurst.com/en/news-and-insights/legal-updates/smart-contracts---can-code-ever-be-law/ (last visit: 30.4.2018).

[169] **Lauslahti (et al.)**, p. 13.

Sale of Goods (CISG)[170] and UNIDROIT Principles of International Commercial Contracts (PICC)[171]. Thereafter, due to the reason that private law differs from country to country, we are going to address two prominent legal families: Common Law and Civil Law, and respectively, on the basis of the USA and France examples. We are going to terminate this section with discussing DAOs legal status.

A) Smart Contracts under the Contract Law Theory

In spite of the fact that key contractual concepts differ jurisdiction to jurisdiction, in most parts of the world, *sine qua non* components of a contractual agreement are at least offer and acceptance, which functions as indication of the parties' mutual assent[172], consideration (anything carrying a financial value subject to the exchange) and intention to create legal relations[173]. Indeed, further formal or technical requirements exist in different jurisdictions and they are going to be examined in due course.

Since contract law is an entirely remedial institution[174], another interesting and important topic is the relation between established remedies of the contract law and smart contracts. Since parties do not have any authority or effect pertaining to the performance, a breach is impossible *prima facie*. However, it is not ensured that the computer code is going to operate fully in accordance with the parties' desired outcome. Therefore, new questions

[170] CISG (1980), full text is available at: https://www.cisg.law.pace.edu/cisg/text/treaty.html (last visit: 30.4.2018).

[171] PICC (2016), full text is available at: https://www.unidroit.org/instruments/commercial-contracts/unidroit-principles-2016 (last visit: 30.4.2018).

[172] Indeed, parties must have the necessary legal capacity to do so and the assent would not be valid for illegal contracts such as slavery agreements.

[173] See from the old English case law: *Household Fire and Carriage Accident Insurance Co Ltd v. Grant* 4 Ex D 216 (1879) (Thesiger LJ); *Carlill v. Carbolic Smoke Ball Company* 1 QB 256 (1893) (Bowen LJ); on the German civil code: Busche in Münchener Kommentar zum Bürgerlichen Gesetzbuch, 7th ed. 2015, Vor §145 ¶31; and on the French Code Civil: *Case Société Chronopost v. Société Banchereau,* Number of appeals: 93-18632 (1996). Available at: https://www.legifrance.gouv.fr/affichJuriJudi.do?idTexte=JURITEXT000007035966 (last visit: 30.4.2018); In: **Zetzsche**, D. A., **Buckley**, R. P., **Arner**, D. W. (2017). The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain, p. 30, footnote 108.

[174] **Werbach**, **Cornell**, p. 318.

arise about the remedies: what remedies will be provided in case the computer code leads parties to an unexpected or undesirable outcome? Who will be at fault if the computer code misreads the external circumstances? We are going to address different opinions regarding to the possible remedies.

a) Offer and Acceptance / Declaration of Intent

Existence of a binding legal agreement requires mutual assent (*consensus ad idem*), in other words, "*meeting of the minds*", which means that the offeror and the offeree must have to disclose a shared understanding and willingness to be bind with the contract's terms[175]. In the context of smart contracts, it is controversial whether the computer code truly represents the parties' mind[176].

First of all, under the contract laws, there is no explicit prohibition on expressing contractual terms via data[177]. This inference is in the same direction with the technological neutrality[178] principle, which is also one of the guiding principles of UNCITRAL for its works[179]. Accordingly, pursuant to the Model Law on Electronic Commerce (1996) (EC Model Law) and the Convention on the Use of Electronic Communication in International

[175] **Kolvart(et al.)**, p. 135. Unlike the traditional subjective theory, the modern contract doctrine requires only the objective manifestations of an assent.

[176] Actually, even for the natural language contracts, one cannot ensure that the contract is fully representing both parties' exact intentions. Parties might have a different understanding pertaining to the same terms. As an English judge contended, "*The words used may, and often do, represent a formula which means different things to each side, yet may be accepted because that is the only way to get 'agreement' and in the hope that disputes will not arise*." Lord Wilberforce in Prenn v Simmonds [1971] 1 WLR 1381 at 1385.

[177] "*At a minimum, contract laws do not explicitly prohibit expressing contractual obligations in terms of data.*" **Surden**, p. 656.

[178] In different context, technological neutrality can indicate three different meanings. First, it means technical standards should explain the desired outcome, but companies are free to adopt whatever technology in order to reach that outcome. Other meanings are pertaining to the regulation. Second, the same regulatory principles should apply regardless of whatever technology is being used. Lastly, regulations should not be drafted in a way to make a technology more advantageous than the others. In other words, regulators should refrain from steering market behavior to a particular structure. **Maxwell**, W. J., **Bourreau**, M. (2014). Technology Neutrality in Internet, Telecoms and Data Protection Regulation. Computer and Telecommunications Law Review. Forthcoming. Available at: https://ssrn.com/abstract=2529680 (last visit: 30.4.2018).

[179] "*One of the principles guiding UNCITRAL in its works in electronic commerce is the principle of technology neutrality or technological neutrality, which means that the law should neither require nor assume the use of a particular technology for communicating or storing information electronically*". **Takahashi**, supra note 67, p. 3.

Contracts (2005) (EC Convention), an offer and acceptance might be expressed via data messages stored on a blockchain[180].

As distinct from contracts concluded in form of speech, writing or action; a smart contract is an automated computer program. However, some smart contracts contain the same characteristics with conventional contracts. In general, subsequent to the formulation in a programming language, smart contracts are transferred to blockchain, which will provide tamper-proof execution. At that point, another party might join and initiation of the execution would be dependent on fulfilling preset conditions. In that regard, the system begins to display contract-like characteristics once the digital assets are transferred to the blockchain for management and then redistributed subject to the result of the "if-then" mechanism[181]. However, not every "smart contract" resembles an agreement, since the term is commonly being used for other types of programs in blockchain. For example, a smart contract might be used merely as a data router, such as transferring the contents of a crypto-wallet to another[182]. In parallel with that, smart contracts in which digitizing a process without including any contractual terms (expressly or implicitly) would not be regarded as a legal contract[183]. The underlying reason is that parties have to agree to use a smart contract as an implementation mechanism of the contract terms; in the contrary case, the smart contract would not constitute a part of a legal contract and therefore would not be legally binding[184].

To prevent uncertainty, prudent contracting parties can take some measures. The simplest solution in order to bridge the gap between executable computer code and legal

[180] Article 11 (1) of the EC Model Law provides that: "*In the context of contract formation, unless otherwise agreed by the parties, an offer and the acceptance of an offer may be expressed by means of data messages. Where a data message is used in the formation of a contract, that contract shall not be denied validity or enforceability on the sole ground that a data message was used for that purpose*". Full text is available at: http://www.uncitral.org/pdf/english/texts/electcom/V1504118_Ebook.pdf (last visit: 30.4.2018); this provision is also affirmed by Article 8 of the EC Convention, full text is available at: https://www.uncitral.org/pdf/english/texts/electcom/06-57452_Ebook.pdf (last visit: 30.4.2018).

[181] **Lauslahti (et al.)**, p. 13; it is possible to see the offer-acceptance mechanism in some smart contracts. For example, in a crowdfunding mechanism which utilizes smart contracts, the beneficiary makes his or her offer with presetting the terms. On the other hand, the contributor makes an acceptance to the offer by behavior with transferring a certain asset to the pool. **Savelyev**, p. 11.

[182] Id., p.13.

[183] An R3 and Norton Rose Fulbright White Paper, p. 5.

[184] **Kolvart (et al.)**, p. 140.

contracts is to create a "*wrapper*". This can be done by the contracting parties, by accepting natural language terms which confer bindingness to the executable code's future transactions. Consent can be shown by such as clicking an "*I agree*" button to the set of terms[185]. If there are no further legal formality requirements, it is very likely that the smart contract and the outcome of its self-execution will be recognized as legally binding[186]. With this minimal wrapper, parties acknowledge that they will be binding with the outcome of the "black-box" (since parties cannot know the exact output of the machine), regardless of whether it caters the actual expectations of the parties. Therefore, it is advisable for the parties to incorporate terms related to the expected outcome of the contract into the wrapper, in order to be able to sue for the remedies in a worst-case scenario.

In most circumstances, parties would need external support in order to establish a smart contract. Thus, another pitfall in front of the smart contracts' formation is explaining the code to the parties. If both parties' understanding of the code differs, then it is very difficult to establish *consensus ad idem* under the modern objective contract law theory. However, although the smart contract does not reflect the real intent of the parties', it is going to execute itself even in the case of duress, deceit or unconscionability. If there is no open door left for a dispute resolution tool by the computer program (since an arbiter does not exists on blockchain), the most effective recourse for someone who improperly concluded a smart contract would be to sue for restitution of the ill-gotten gains, only subsequent to execution of the smart contract[187]. Hence, smart contracts reverse the burden of litigation

[185] In a very minimal level, clicking that button indicates that, "*We, the parties, agree that (i) this is a contract and (ii) the output of this self-executing process is its performance*". **Clifford Chance Law Firm**, p. 7; **Sherborne**, p. 5.

[186] **Clifford Chance Law Firm**, p. 5; "*Accordingly, insofar as smart contracts represent components of legally binding agreements, they are binding if specifically incorporated by reference into a written agreement*". **Adlerstein**, D. M. (June 26, 2017). Are Smart Contracts Smart? A Critical Look at Basic Blockchain Questions. Available at: https://www.coindesk.com/when-is-a-smart-contract-actually-a-contract (last visit: 30.4.2018).

[187] **Werbach**, **Cornell**, p. 370; admitting that none of them are optimal, Savelyev suggests two possible solutions which can entitle government authorities to interfere smart contracts in order to use their enforcement. The first option is to create a "super-user" for the government authorities. This super-user will have a right to alter the content of blockchain databases pursuant to a specified procedure which enables to reflect the decisions of the state authorities. Indeed, this approach would undermine the main advantage of blockchain: resilience to data manipulations from outside and unique level of trust. The second option is pursuing specific users in the "offline" mode and forcing them to make changes. This model is not only time-consuming but also inefficient. Moreover, jurisdictional problems make it even harder to enforce decisions. **Savelyev**, p. 22; "*In summary, courts would only be able to force the parties to execute a secondary transaction or otherwise pay remedies for a smart contract that created damages for one of the parties*". **Kaal**, **Calcaterra**, p.41.

since a "wronged" party will have to sue to reverse performance and claim damages, rather than suing for failure of performance and claiming damages[188].

In light of the aforementioned explanations, the formation of smart contracts significantly differs from the traditional offer-acceptance concept[189]. However, as the development of electronic commerce has brought out the need to recognize different means of contract formation, modern legal systems must allow for different contract formation models[190]. All in all, in the case of smart contracts, the parties' act of sending their cryptographic private keys in order to commit their resources to the smart contract is an indication of a declaration of intent[191]. Last but not least, even though a smart contract would not be recognized as a legally binding agreement, it does not *ipso facto* mean that it has no legal meaning at all. To illustrate, in the wake of a case-by-case analysis, a smart contract might be construed as a unilateral undertaking of performance of a contract condition precedent or condition subsequent in a contract, unilateral legal transaction, and a statutory decision[192].

b) Consideration

Consideration is something of value in the eyes of the law[193] and it is an essential component of a legally binding contract, mostly in common law jurisdictions[194].

[188] **Allen & Overy LLP** (2017). Smart Contracts for Finance Parties, p. 2. Available at: http://www.allenovery.com/SiteCollectionDocuments/Smart_contracts_for_finance_parties.pdf (last visit: 30.4.2018).

[189] In this respect, implied contracts and tacit agreements are the most relevant concepts for smart contracts. For further information, see: **Lauslahti (et al.)**, p. 14.

[190] **Von Bar**, C. (et al.) (2009). Principles, Definitions and Model Rules of European Private Law: Draft Common Frame of Reference (DCFR). European Law Publishers GmbH, p. 290; for example, on the basis of private parking enforcement, the Supreme Court of Finland ruled that the traditional offer-acceptance mechanism provided in the Contracts Act do not correspond with all circumstances pertaining to the conclusion of a contract anymore. KKO 2010: 23, In: **Lauslahti (et al.)**, p. 15.

[191] **Werbach**, **Cornell**, p.368.

[192] **Van Heukelom**, S., **Naves**, J., **Van Graafeiland**, M. (2017). White Paper: Legal Aspects of Blockchains. Section 3.5. Available at: https://www.pelsrijcken.nl/actueel/publicaties/whitepaper-juridische-aspecten-van-blockchain (last visit: 30.4.2018).

[193] Thomas v Thomas (1842) 2 QB 851; as a leading figure in the modernization of English legal studies, Sir Frederick Pollock's definition is being regarded important due to the fact that it is adopted by the House of Lords. According to Sir Pollock, consideration is "*An act of forbearance of one party, or promise thereof, is the*

Correspondingly, it is the element which differs contracts from unenforceable gifts or promises of love and affection which creates nothing but moral obligations. However, in that context, nothing prevents parties to encode a gift promise on blockchain. The reason is that there is no inherent test provided by blockchain concerning the consideration and it might even be hard to identify the flows of assets in open source and permissionless blockchain systems. Apart from these, due to the technical limitations of blockchain; a currency, a stock or a commodity is likely to be a better candidate as a consideration rather than performance of a personal service, in case of smart contracts[195].

In the eyes of the common law courts, consideration is not a difficult pre-condition to fulfill. Reciprocity is the main focus; the mutual exchange does not have to be of equivalents[196]. Exchange of the considerations can take different forms such as virtual assets, traffic (advertorial value), fee payment or any goods and services. However, if there is no consideration, the smart contract should be acknowledged in a purely technical sense. As a matter of fact, for these type of "smart contracts" (e.g. whether forecast apps), legal enforcement is not a real necessity.

c) Legal Capacity

price for which the promise of other is bought, and the promise thus given for value is enforceable". Dunlop Pneumatic Tyre Company Ltd vs. Selfridge & Company Ltd. [1915] AC 847.

[194] "*Promises become binding when there is a meeting of the minds and consideration is exchanged. So it was at King's Bench in common law England; so it was under the common law in the American colonies; so it was through more than two centuries of jurisprudence in this country; and so it is today*". Specht v. Netscape Commc'ns. Corp. (2001), 150 F. Supp. 2d 585, 587. The fact remains that, in some common law jurisdictions (such as New Zealand) a promise without consideration is binding if it is written on a deed. See: Aluminium Systems (NZ) Ltd v Hodgson & Anor HC Hamilton CIV-2009-419-000608, 19 August 2009 at [20]; on the other hand, this is not a case for most civil law jurisdictions and some mixed legal systems such as Scotland. In these legal systems, intent to make an offer accompanied by a legal cause may usually be sufficient to establish a contract. For instance, pursuant to the Colombian Law, a contract is valid if it is concluded freely by at least two parties with capacity and consent. See: Colombia Codigo Civil [C.C.] [Civil Code] Art. 1495. **Fandl**, K. J. (2016). Cross-Border Commercial Contracts and Consideration. Berkeley Journal of International Law, 34(2), p. 4. Available at: http://scholarship.law.berkeley.edu/bjil/vol34/iss2/1 (last visit: 30.4.2018); "*Generally speaking, laws based on the Roman contract law don't insist on consideration as a precondition for obligations*". **Zetzsche (et al.)**, p. 30, footnote 111.

[195] **Levy**, p. 11.

[196] **Mik**, supra note 8, p. 14.

Capacity is the attribute of persons which enables them to perform civil or juristic acts[197]. In order to have a legal capacity and using it to enter into an agreement, a person has to satisfy some legal qualifications such as legal age or soundness of the mind. As it was the case with consideration, there is no means to test the capacity on blockchain. Thus, unlike the payment services such as PayPal, minors can run online wallets and own Bitcoins although they are not entitled to have credit cards[198]. Moreover, for example, it is very difficult to ascertain if someone who does not have the required soundness of the mind signed the digital smart contract while the other party exploited this circumstance.

At this point, an analogy can be made from the contracts that are concluded via internet. As it is the same with the internet transactions, transactions on blokchain is made relying on the trust to the other party and herewith, its good faith. Consequently, in case of the absence of legal capacity for one of the parties', the transaction would be regarded as null and void, which harms commercial life and undermines e-commerce. In order to mitigate the possible losses and prevent recession in commercial life, some jurisdictions adopted liberal interpretations. In this direction, in Switzerland, the permission granted by parents for their children to use the internet, has been interpreted in a way which encompasses online transactions, unless otherwise provided[199]. The French legal system hammered the situation out by giving validity to those online transactions, since the minors are already presumed capable for some transactions that are required in daily life[200]. In order to extinguish uncertainty and provide validity, a similar approach would also be feasible for smart contracts.

Identity[201] is an essential concept to determine whether there is a competent legal capacity. In the technical sense, parties to a smart contract are not human. The parties'

[197] **Black's Law Dictionary** (4th edition, 1968), p. 261.

[198] **PayPal**, User Agreement for PayPal Services, § 1.2, "*To be eligible to use the PayPal Services, you must be at least 18 years old or higher based on the age of majority in your jurisdiction…*"

[199] **Jaccard**, M. (2000). Droit Europeen et Compare de l'internet, Rapport National Suisse, pp. 22-23. As cited in: **Özdemir Kocasakal**, H. (2003). Elektronik Sözleşmelerden Doğan Uyuşmazlıkların Çözümünde Uygulanacak Hukukun ve Yetkili Mahkemenin Tespiti. Vedat Kitapçılık, p. 91.

[200] **Özdemir Kocasakal**, pp. 91-92.

[201] Identity is a "*set of attributes related to an entity*". **ISO/IEC 24760-1**. For conceptualizing of the digital identity, see: **Camp**, J. L. (2004). Digital Identity. IEEE Technology and Society Magazine, 23(3), 34-41.

identities are represented by the cryptographic private keys, and mathematical transactions between public and private keys conclude the smart contracts. Thus, there is no restriction for an individual to have multiple accounts backed by different private keys. This means that cryptographic keys are the basis for the parties' digital identity and smart contracts are agreements between cryptographic keys rather than being agreements between people[202]. Over and above, when it comes to the "follow-on" smart contracts, they do not only give the ultimate power of enforcement to computers, but also provide that the contract will be concluded entirely by computer code in line with the pre-set parameters, without any human inclusion. In that case, under the legal point of view, a computer program can be construed as an agent for both parties. Computers as agents for human programmers are not a novel concept and have been used thoroughly for many years, especially in the finance sector. For instance, equity markets tend to be very automated and as a result, functions of typical trade such as order collecting, order routing, execution, matching, reporting, clearing and settlement etc. are automated in a single system or multiple systems are integrated to each other[203]. Notwithstanding that, particularly for the "follow-on" smart contracts, the connection between the agreement and the human is substantially diminished; hence, "follow-on" contracts may not be recognized legally valid in some jurisdictions due to the regulations with regard to electronic agents[204]. However, the legal status of follow-on contracts has yet been explored in depth.

d) Remedies

Since focusing on *ex post* adjudication, contract law is a remedial institution[205]. In order to protect and compensate the innocent parties, legal systems provide different means of

[202] **Werbach**, **Cornell**, p. 372.

[203] **De Bel**, J. (1993). Automated Trading Systems and the Concept of an "Exchange" in an International Context Proprietary Systems: A Regulatory Headache! University of Pennsylvania Journal of International Business Law, 14(2), 169-211, pp. 169-170.

[204] An R3 and Norton Rose Fulbright White Paper, p. 16; for example, the English High Court held that an automated system cannot be regarded as an agent; due to the fact that only persons with a mind are entitled to be agents. Software Solutions Partners Ltd, R (on the application of) v HM Customs & Excise [2007] EWHC 971, at para. 67.

[205] "*The traditional goal of the law of contract remedies has not been compulsion of the promisor to perform his promise but compensation of the promisee for the loss resulting from the breach*". Restatement (Second) of the Contracts (1981), § 16, intro. note, The American Law Institute.

remedies including but not limited to damages, repudiation, rescission, specific performance, injunctions and restitutionary awards. Despite the fact that smart contracts are designed to perform efficaciously without any risk for breach[206], no one can ensure that the contract terms would not contain any bugs nor the results will be in the direction of the parties' expectations[207]. The smart contract might work one party intended only, or -as it can be rarely seen with traditional contracts- it might work neither party intended. In the first instance, the burden of litigation will be shifted and the wronged party must sue to reverse the performance or claim its damages. In the latter case, the parties have various options depending on the relevant law and facts: they might use a cause of action against the developer of the smart contract, or try to void the contract by recoursing courts by putting forward a "mistake" claim as well as seeking remedies against the counterparty[208]. Circumstances in which the agent software is malfunctioned or defective, users might have a remedy against the software's programmer, derived from the license agreement (contractual liability) through which the service was acquired[209]. Eventually, an ODR clause incorporated into the smart contract would be beneficial for both parties, especially in order to avoid any wrongful irreversible performance as well as the need for recoursing to an offline external party. The upshot is, notwithstanding that the content of the remedy concept evolves; remedies are still a must in the context of smart contracts.

The most obvious example, which shows the importance of the remedies in terms of smart contracts, is the so-called "The DAO[210] attack". On June 17, 2016, a hacker has

[206] At this point, a disclaimer should be made. In some contractual structures, even if the code functions perfectly, a breach will always be possible. For example, if the required amount of money is not blocked on a specific account in the first place (which means that parties only gave the account details and waited until a certain event triggers the payment), then in case of an inadequacy of funds when the conditions are met, payment could not be consummated and a formal breach will occur. See: **Savelyev**, pp. 18-19.

[207] **Hourani**, S. (2017). Cross-Border Smart Contracts: Boosting International Digital Trade through Trust and Adequate Remedies. In: UNCITRAL Congress on 'Modernizing International Trade Law to Support Innovation and Sustainable Development, 04-07 July 2017, Vienna.

[208] **Allen & Overy LLP**, p. 2.

[209] **Weitzenboeck**, E. M. (2001). Electronic Agents and Formation of Contracts. International Journal of Law and Information Technology, 9(3), 204-234, p. 232.

[210] The DAO was an open-source code project of the Ethereum Foundation, a Swiss non-profit organization, formed as a digital decentralized autonomous organization and investor-directed venture capital fund. In order to conduct real world interactions, the founders of The DAO established a Swiss based company, DAO. Link, which was registered as a *Société à responsabilité limitée* (SARL). The reason to choose Switzerland was

managed to steal digital currencies from The DAO's investment fund, which equaled to more than $50M USD, by using a programming loophole which enabled him to create a single-controlled subsidiary, a so-called "*child DAO*"[211]. Noticeably, the hacker was a participant in the campaign, instead of being an outsider, as it is usual with the hack cases[212]. In respect, thereof, the hacker stated that he merely used the functioning of the code which permits establishing child DAOs and contended that, "*I (...) have rightfully claimed 3,641,694 Ether, and would like to thank the DAO for this reward*"[213]. Furthermore, due to the fact that The DAO is decentralized, which makes it free from any governing law purportedly, the hacker claimed that the participants are only bound with the smart contract's code and do not have additional obligations or guarantees beyond what is set forth by the code itself[214]. As a result, it is alleged that no illegal dimension exists in his actions under the U.S. criminal and tort law. However, dissenting with that opinion, the Ethereum developers decided to initiate a hard-fork, which functioned as a tool for transferring all stolen Ethereums into a new wallet, which

explained by Simon Jentzsch, who states that Swiss Law enables to "*take money from an unknown source as long as you know where it's going*". By means of the lack of the centralized authority, it had an aim to reduce costs and provide more control and access to the investors. In line with that, entirely instantiating on the Ethereum Blockchain, it did not have any board of directors or any other conventional management structure. It met with approval among the investors and set the record for the largest crowdfunding campaign in history, as it raised an equivalent of $120M USD in digital currency. In late 2016, due to the technical (security) and legal vulnerabilities, The DAO was de-listed from the cryptocurrency exchanges such as Kraken and Poloniex. For details about the rise and fall of The DAO: **Falkon**, S. (December 24, 2017). The Story of the DAO - Its History and Consequences. Available at: https://medium.com/swlh/the-story-of-the-dao-its-history-and-consequences-71e6a8a551ee (last visit: 30.4.2018); about crowdfunding process: **Waters**, R. (May 17, 2016). Automated Company Raises equivalent of $120M in Digital Currency. Financial Times. Available at: https://www.cnbc.com/2016/05/17/automated-company-raises-equivalent-of-120-million-in-digital-currency.html (last visit: 30.4.2018).

[211] **Siegel**, D. (June 27, 2016). Understanding the DAO Attack. Available at: https://www.coindesk.com/understanding-dao-hack-journalists (last visit: 30.4.2018).

[212] In fact, there is an ongoing discussion on whether this attack can be called as a "hack" at all. According to one point of view, since the clauses of the smart contract are the code itself, it is merely an enforceable implementation of the smart contracts' terms. However, this is a minority opinion and it is not approved in a large extent. It comes with the territory of the viability of smart contracts in a wider scope and protection against malfeasance. See: **O'Shields**, p. 184, footnote 57.

[213] **Kastelein**, R. (June 18, 2016). The Dao Hacker Speaks out about Exploit and Claim to 3,641,694 Ether Worth $50 Million USD. Available at: http://www.the-blockchain.com/2016/06/18/thedao-hacker-speaks-exploit/ (last visit: 30.4.2018).

[214] Id.

was used for refunding the Ethereums to the investors, and shut down The DAO[215]. Ultimately, even though the proposal caused some eyebrows to raise in the media, due to the fact that the implication of a hard-fork will undermine the trust to DLT, the Ethereum community decided to take this poison pill[216]. Lesson to be drawn from this case is that although hard-forking (which functions similarly to a contract rescission) is not a known phenomenon in terms of contract law; it is applicable and can be useful as an emergency switch when the wheels have come off[217].

No consensus exists with regards to remedies for breaches of smart contracts. Some argue that the existing legal principles will apply, as smart contracts replace legal contracts[218]. However, others argue that the breaching party is not always attainable because of the system's decentralized nature; hence, pursuant to the assumption, the operator of the blockchain platform has a legal obligation to identify the breaching party, which leads these scholars to the conclusion that the operators must be required to take place as a counterparty in a dispute scenario[219]. According to Cavanillas, *"(...) e-suppliers should pay the 'cost of confidence' in e-commerce (the cost of the probability of unwanted contracts being concluded by mistake and the cost of the technical tools and procedures employed to reduce the probability of mistakes)*[220]" .

Eventually, in spite of all these ongoing discussions, it is still unclear as to who is accountable and to what extent. To decrease uncertainty, new regulations might be useful. As a conclusion, at present, the blockchain-based dispute resolution is the only feasible way of

[215] **Hinkes**, A., A Legal Analysis of the DAO Exploit and Possible Investor Rights (June 21, 2016), available at: https://bitcoinmagazine.com/articles/a-legal-analysis-of-the-dao-exploit-and-possible-investor-rights-1466524659/ (last visit: 30.4.2018).

[216] In addition, SEC's investigation report on The DAO states that the US Securities Law may apply when it is appropriate. Therefore, it can be taken as an indication that parties are still bound with the applicable national rules apart from the code itself, even though the governing law is not clear. For the investigation report see: supra note 70.

[217] **Trüeb**, p. 710.

[218] **Kaal**, **Calcaterra**, p. 38.

[219] Id, p. 38.

[220] **Cavanillas**, S. An Introduction to Web Contracts, p. 15. In: **Walden**, I., **Hörnle**, J. (ed.) (2001). E-Commerce Law and Practice in Europe. Woolhead Publishing Limited.

avoiding the uncertainty related to remedy issues and providing a foreseeable recourse method for smart contract disputes.

B) Formation of the Smart Contracts in International Commercial Arbitration

Taking into account that international commerce cases frequently involve parties from different states, in order to conceptualize smart contracts under the contract law theory, one should go beyond the domestic legislations (and principles) and scrutinize smart contracts in the context of international arbitration and its thoroughly applicable standardized legal instruments, such as the CISG and the PICC. The Blockchain-based automated dispute resolution will probably also make use of these existing standards until new standards -which are designed in compliance with its own nature- are emerged. The reason is that parties to a contract would like to have a reliable due process and foreseeable outcome. In parallel with that, in the upcoming sub-sections, we are going to discuss the standardization of business laws and why it is also significant for smart contracts. Thereafter, we are going to associate smart contracts with the CISG and PICC.

a) Standardization of the Business Laws and Smart Contracts

In the contemporary world, structures of the commercial agreements have come to being relatively standardized[221]. Recitals, definitions, monetary provisions, representations & warranties, end-game provisions and boilerplate clauses such as a dispute resolution clause and a choice of law clause, are some of the examples of prevalent provisions. In the same vein, unification of business laws on international level is more than a necessity, since the volume of international trade is growing faster than ever within the last decades due to the effect of technological developments and globalization[222]. This uniformity would not only reduce transaction costs and uncertainty, but will also provide parties a neutral, familiar and efficient

[221] **Shadab**, H. (July 26, 2017). Techno Legal Standards Are Needed for Smart Contracts. Available at: https://www.hyperledger.org/blog/2017/07/26/techno-legal-standards-are-needed-for-smart-contracts (last visit: 30.4.2018).

[222] **Ortiz-Ospina**, E., **Roser**, M. (2018). International Trade. Available at: https://ourworldindata.org/international-trade (last visit: 30.4.2018).

legal infrastructure while they are operating transnational transactions[223]. While the economic order evolves, removing unnecessary barriers, encumbering trade, is of paramount importance[224].

Arbitration is an inextricably intertwined part of this aforementioned trade expansion and nearly all scholars seem to agree that "*international arbitration is regarded by the international business community as the normal means of settling disputes arising from international transaction*"[225]. Despite the fact that there are plenty of reasons to choose arbitration, in our context, one important reason is that parties usually think that distrust to a foreign jurisdiction can be eliminated by incorporating an arbitration clause[226]. Since smart contracts have an aim to eliminate intervention of national jurisdictions as much as possible, by utilizing automation, it would not be wrong to infer that the relationship between smart contracts and arbitration, especially the online version equipped with a multi-sig mechanism which offers easy enforcement, have a promising future.

In light of the foregoing explanations, the CISG is our first reference point. It is not only due to the CISG's worldwide success [227] or function as a harmonization and

[223] **Güzeloglu**, F. E. (March 29, 2016). Modern International Trade and the Significance of the CISG. Available at: https://www.lexology.com/library/detail.aspx?g=14aa8ea8-6d85-4cd1-bb09-1fb59018c62d (last visit: 30.4.2018).

[224] Eiselen recommends adoption of the CISG into South African Law, as although countries located at the Southern Africa have the same contract law background; there is no unified law of sale which impedes international trade. **Eiselen**, S. (1999). Adaption of the Vienna Convention for the International Sale of Goods (The CISG) in South Africa. The South African Law Journal, 116, 323-370, p. 324.

[225] **Schultsz**, J. C., **Van Den Berg**, A. (1982). The Art of Arbitration. Liber Amicorum Sanders, Kluwer, p. 287. As cited in: **Casella**, A. (1992). Arbitration in International Trade. National Bureau of Academic Research Working Paper Series. Working Paper No. 4136. Available at: http://www.nber.org/papers/w4136.pdf (last visit: 30.4.2018); empirical evidence also directs us to the same result. For example, a study by Mistelis shows that almost four-out-of-five CISG-related cases are settled via arbitration. **Mistelis**, L.A. (2011) in UN Convention on Contracts for the International Sale of Goods (CISG), article 1 (**Kröll**, S.M., **Mistelis**, L.A. & **Viscasillas**, P. P. ed.), C.H. Beck, Hart & Nomos: Munich, para. 18.

[226] **Janssen**, A., **Spilker**, M. (2015). The Relationship Between the CISG and International Arbitration: A Love with Obstacles? Contratto e Impresa / Europa, 44-74, p. 47.

[227] Currently, the CISG has been ratified by 89 contracting states which control a significant percentage of the world's trade volume. To see signatory parties as of April 5, 2018: United Nations Treaty Collection, Depositary, Status of Treaties, Chapter X, 10, available at: https://treaties.un.org/doc/Publication/MTDSG/Volume%20I/Chapter%20X/X-10.en.pdf (last visit: 5.4.2018); "*All in all, the story of the CISG has been one of the worldwide success*". **Schwenzer**, I., **Hachem**, P. (2009). The CISG- Successes and Pitfalls. The American Journal of Comparative Law, 57, 457-478, p. 478; Schlechtriem argues that in some countries, jurists are familiar with the CISG as they are with their domestic law.

transplantation vehicle in the matter of international sale of goods, but also due to the philosophy behind it. The drafters of the convention were fully aware that beyond the legal-technical dimension, it was all about making comprehensive comparative legal analysis and proposing something politically acceptable[228]. The reason to this, despite all the attempts to increase harmonization among contract laws, even within the European Union (EU), there was no uniformity with respect to contract law and this put the parties -who are unfamiliar with the counterparties' domestic law- under the risk of "*substantive loss of claim or unsuspected liabilities*"[229]. Eventually, these endeavors came up with fruitful results and as one commentator stated, the CISG has been proliferated to "*every geographical region, every stage of economic development and every major legal, social and economic system*[230]". Therefore, understanding the CISG's relationship with smart contracts is important for two main reasons: first, it is very likely to see the CISG coded as the governing law into smart contracts related to international sale of goods when smart contracts start being used widely in practice. Second, this experience and the philosophy behind it can be a useful role model for establishing standards for smart contracts.

As a type of "*Esperanto*" law[231], the UNIDROIT Principles of International Commercial Contracts, or PICC, can also find a scope of application for smart contracts as a

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He defines the convention as the "*lingua franca*" of sales. **Schlechtriem**, P. (2005). Requirements of Application and Sphere of Applicability of the CISG. Victoria University of Wellington Law Review, 36, 781-794, pp. 781-782.

[228] **Zeller**, B. (2002). The Significance of the CISG for the Harmonisation and Transplantation of International Commercial Law. Unpublished, p. 1. Available at: https://core.ac.uk/download/pdf/10826626.pdf (last visit: 30.4.2018).

[229] **Von Bar**, C., **Lando**, O., **Swann**, S. (2002). Communication on European Contract Law: Joint Response of the Commission on European Contract Law and the Study Group on a European Civil Code. European Review of Private Law, 10(2), 183-248, p. 198.

[230] **Felemegas**, J. (Last Updated: November 5, 2002). The United Nations Convention on Contracts for the International Sale of Goods: Article 7 and Uniform Interpretation. Pace University CISG Database, available at: http://www.cisg.law.pace.edu/cisg/biblio/felemegas.html (last visit: 30.4.2018).

[231] To describe the role of the PICC, this metaphor is introduced by an Oxford author. **Vogenauer**, S. (April 21, 2015). An Overview of the UNIDROIT PICC, with Stefan Vogenauer . Available at: https://blog.oup.com/2015/04/unidroit-picc-stefan-vogenauer/ (Last Updated: November 5, 2002) (last visit: 30.5.2018).

global background law[232]. Interestingly enough, even though it is rarely being chosen by the parties, adjudicators have a tendency to use it as a means of interpretation and supplementation of international commercial law when parties refer to the *lex mercatoria* or international practice[233]. Thus, associating the principles with the smart contracts is useful in terms of the international commercial law, since the PICC provides a balanced set of rules on all aspects of general contract law, such as formation, interpretation, performance and remedies, authority of agents, limitation periods etc.

Consequently, in the context of smart contracts, it is even more important to standardize the process, since they contain some extra risks in comparison with the paper contracts. Simply, the legality of the code text is purely an issue. Moreover, technical limitations and bugs make it difficult to reflect the parties' exact intent on the code. Hence, it is important to test some standards and observe the results for future applications. Some scholars even argue that emergence of crypto law and new standards, challenge the fundamental differences between legal structures; accordingly, with the transformation of the legal statutes and regulations into code, the gap between common law and civil law jurisdictions will narrow[234]. Notwithstanding that, there is no urgency for a globally unified solution[235]. Party autonomy is the cornerstone of contract law and it enables parties to choose the legal system with the best rules for their contract[236]. As a result, it triggers the competition among the states and a unification attempt might be initiated subsequent to the emergence of the most favored rules[237].

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[232] **Michaels**, R. (2014). The UNIDROIT Principles as Global Background Law. Uniform Law Review, 19, 643-668, p. 644.

[233] Id, pp. 647-648.

[234] **Reyes**, p. 429.

[235] And it is not easy to single out such solution immediately, since the cyberspace is difficult for the law to keep pace with and understand. The rapidly changing nature of technology contradicts with the philosophy which claims for the rules to be effective and for the content of the law to not change rapidly. See: **Lee**, E. (2002). Rules and Standards for Cyberspace. Notre Dame Law Review, 77(5), 1275-1372, p. 1307.

[236] "*Party autonomy is one of the leading principles of contemporary choice of law*". **De Boer**, T. M. Party Autonomy and Its Limitations in the Rome II Regulation. In: **Volken**, P., **Bonomi**, A. (2007). Yearbook of Private International Law . Volume IX, 19-29, p.19.

[237] **Takahashi**, supra note 67, p. 18.

b) Smart Contracts under the CISG and PICC

Before discussing smart contracts' formation in the context of the CISG, the scope of application of the CISG is required to be elaborated in order to see which of smart contracts fall under the scope of application of the convention. The CISG does not provide an explicit definition of what constitutes a "*contract of sale*"[238]. However, Article 2 exempts some sort of sales from the CISG's scope of application. Pursuant to Art. 2 (d) of the CISG, the convention does not apply to sales of stocks, shares, investment securities, negotiable instruments or money[239]. In addition, according to the general understanding concerning the "goods", they are basically only tangible objects[240].

In light of this information, the first question needed to be addressed is whether the contracts pertaining to buying cryptocurrencies with traditional currencies fall under the scope of the CISG. If we take Bitcoin (the best-known and discussed cryptocurrency or electronic cash to date[241]) as our reference point, without much doubt, the answer is negative. First, if convertible virtual currencies can be considered as property at all, they are a kind of "*intangible property*"[242], since it is seen that they are incapable of being owned, which is ascertained by the District Court of Tokyo - a case aroused subsequent to the collapse of a

[238] **Takahashi**, K. (November 2, 2015). Applicability of the CISG. Available at: http://cryptocurrencylaw.blogspot.nl/2015/11/applicability-of-cisg.html (last visit: 30.4.2018).

[239] The CISG, Article 2(d), supra note 175.

[240] Indeed, there are some exemptions, such as computer programs (software), due to their corporeal nature as goods. **Schlechtriem**, P. (1998). Commentary on the UN Convention on the International Sale of Goods (CISG). Oxford University Press. 2nd ed., p. 23; § 433 of the German Civil Code (Bürgerliches Gesetzbuch) and the US federal Uniform Commercial Code (U.C.C. Article 2 § 2-106) are also only applicable for the sale of movable (physical) things. **Boehm**, F., **Pesch**, P. Bitcoin: A First Legal Analysis - With Reference to German and US-American Law. In: Challenges and Opportunities Associated with a Bitcoin-Based Transaction Rating System, Conference: First Bitcoin Research Workshop at Financial Cryptography and Data Security, 2014, 43-54, p. 50.

[241] Bitcoin "(…) *is generally regarded as the best-known virtual (or electronic, digital) currency to date*". **Lo**, S., **Wang**, J. C. (2014). Bitcoin as Money? Current Policy Perspectives, Federal Reserve Bank of Boston, No. 14-4, p. 2. Available at: http://bahler.co/wp-content/uploads/2016/11/Bitcoin-as-Money-Fed-Res.pdf (last visit: 30.4.2018).

[242] **Low**, K. F. K., **Teo**, E. G. S. (2017). Bitcoins and Other Cryptocurrencies as Property? Law, Innovation and Technology, 9(2), 235-268, pp. 245-246; "*For sales tax purposes, convertible virtual currency is intangible property*". New York State Department of Taxation and Finance Taxpayer Guidance Division (December 5, 2014). Tax Department Policy on Transactions Using Convertible Virtual Currency, p. 1. Available at: https://www.tax.ny.gov/pdf/memos/multitax/m14_5c_7i_17s.pdf (last visit: 30.4.2018).

Bitcoin exchange, Mt Gox[243]. Second, even though Bitcoin and other cryptocurrencies are not "*money*" in strict sense[244], they are designed as payment alternatives to traditional money and have a goal to fulfill three functions -of money-, which are construed by the economists: an instrument that serves as a medium of exchange, a unit of account and a store of value[245]. Despite the fact that cryptocurrencies still have serious deficiencies with regards to the fulfilling of all three functions, in some circumstances, they might be acknowledged as "money" for a particular purpose by the courts or tribunals[246].

The second issue is whether or not the CISG's scope of application extends to contracts in which goods are bought with cryptocurrencies. The answer depends on whether the payment with cryptocurrencies should be interpreted as the equating "payment of price", in terms of CISG, Article 53. If the answer is negative, then such contracts would constitute barter contracts[247]. However, in the context of sale of goods[248], cryptocurrencies do not have any other purpose than to be a means of payment, as it is clearly stated by the Court of Justice of the European Union (CJEU) in its Value Added Tax (VAT) judgment[249]. Moreover,

[243] Id, p. 246; the court ruled that Bitcoin is "*not subject to ownership*". **Caffyn**, G. (August 19, 2015). Tokyo Court: Bitcoin is Not Subject to Ownership. Available at: https://www.coindesk.com/tokyo-court-bitcoin-not-subject-to-ownership-2/ (last visit: 30.4.2018); to the contrary, a Dutch court classified Bitcoin as a "transferable value" and held that it demonstrates all characteristics of a "property right". ECLI: NL: RBAMS: 2018: 869. Available at: https://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:RBAMS:2018:869 (last visit: 30.4.2018).

[244] For instance, it is obvious that the "money" definition provided by the US Federal Uniform Commercial Code (UCC) only intended to cover hand-to-hand money, even excluding deposit accounts. **Schroeder**, J. L. (2016). Bitcoin and the Uniform Commercial Code. University of Miami Business Law Review, 24(1), 1-79, p. 17; "… *bitcoins cannot be classified as money that is meant to be an official currency*". **Boehm**, **Pesch**, p. 50.

[245] **Lo**, **Wang**, p. 3.

[246] For example, in S.E.C. v. Shavers, No. 4:13-CV-416 (E.D. Tex. Aug. 6, 2013), the judge ruled that investing Bitcoin on the promise to receiving a greater amount of Bitcoin in the future, constitutes investing "money" under a very limited purpose, in terms of the *Howey test* (S.E.C. v. W.J. Howey Co., 328 U.S. 293, 298-99 (1946)), which defines investment contracts. **Schroeder**, pp. 16-17, footnote 49.

[247] Basically, barter is the exchange of one commodity for another without inclusion of any money. The author gives an example of a farmer who is willing to buy a tomato seed in exchange for broccoli instead of paying money. **Horowitz**, A. J. (2010). Notes: Revisiting Barter Under The CISG. University of Pittsburgh Journal of Law and Commerce, 29(1), 99-115, p. 100.

[248] In other legal contexts, different purposes such as using as a speculative investment vehicle, might exist. **Takahashi**, supra note 238.

[249] C-264/14 ECLI:EU:C:2015:718, para 24.

recognizing payment with cryptocurrencies as a "*payment of price*", would be a more accurate interpretation since cryptocurrencies have no intrinsic value[250], at least other than virtual[251].

Articles in between 14-24 of the CISG regulate the formation of the contracts. As traditionally, there has to be two declarations of intent: offer and acceptance. In order to fulfil the requirements of the CISG, a contract must comprise the description, the quantity and the price of the goods; albeit, the latter does not have to be expressed explicitly[252]. Determinability of the price of goods is sufficient for the contract formation under CISG, Article 14[253]. This means that the parties do not have to fix the price as a certain number; instead, it is possible to agree on a formula, which designates the calculation of the price. Therefore, pursuant to Article 14 (1) of the CISG[254], smart contracts which are encoded with the absence of at least a determinable price or quantity, have no existing offer; and as a result, the contract is not concluded effectively[255]. Moreover, as a rule of thumb, smart contracts are legally binding only if the parties agree to use smart contracting as an implementation solution[256]; using a wrapper, in this sense, can ensure that this intention has been shown clearly.

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[250] **Yermack**, D. (2013). Is Bitcoin a Real Currency? An Economic Appraisal. National Bureau of Academic Research Working Paper Series. Working Paper 19747, p. 9.

[251] Adam Hayes considers that although it is not directly comparable to tangible intrinsic value, i.e. gold, Bitcoin and its cousins have a virtual intrinsic value. **Hayes**, A. (2015). Cryptocurrency Value Formation: An Empirical Analysis Leading to a Cost of Production Model for Valuing Bitcoin. MCIS 2015 Proceedings, 4, p. 2; according to the results of an empirical research, it is contended that the value of cryptocurrencies are driven by its popularity and the transactional needs of its users. **Polasik, M. (et al.)** (2015). Price Fluctuations and the Use of Bitcoin: An Empirical Inquiry. International Journal of Electronic Commerce, 20(1), 9-49, p. 33.

[252] **Kolvart (et al.)**. p. 140.

[253] The CISG, Article 14, supra note 170.

[254] **Kröll (et al.)**. Article 14, para 32.

[255] **Vural**, B. (2013). Formation of Contract According to the CISG. Ankara Bar Review, 1, 127-151, p. 132; notwithstanding that, Article 55 of the CISG provides an exemption which is explained by Schlechtriem as follows: "*If the parties have performed the contract despite no definite price having been agreed, or have in other way made clear that they wanted to perform the contract, the requirement of a sufficiently definite or determinable price can be seen as having been excluded by the parties. Accordingly, a valid contract has been concluded and the price has to be determined according to Art.55 CISG*". **Schlechtriem**, P., **Butler**, P. (2009) UN Law on International Sales. Springer-Verlag, para 76, p. 72. However, the application of this article is not clear in case of tamper-proof smart contracts due to the fact that parties do not have any authority to intervene the performance.

[256] **Kolvart (et al.)**, p. 140.

Even though the CISG does not require any form restriction for contracts[257] -which means that even oral contracts are valid-, Article 13 provides that the 'writing' form includes telegram and telex[258]. On the other hand, the convention remains silent on whether or not computer-based contracts[259] are acceptable in that sense. The underlying reason to is that the ratification of the CISG preceded at least a decade before electronic contracts practically came into sight[260]. However, in respect of electronic communication between the parties, the EC Convention applies when the CISG is applicable, as it is stated in Article 20 (1) of the EC Convention[261]. Pursuant to the EC Convention, offer and acceptance can be expressed (and taken as evidence by the courts) through data messages stored on blockchain[262]. By the same token, the principle of functional equivalence "singles out basic functions of paper-based form requirements, with a view to providing criteria which, once they are met by data messages, enable such data messages to enjoy the same level of legal recognition as corresponding paper documents performing the same function [263] ". Even before ratification of the EC Convention[264], it was possible to reach the same conclusion by interpreting the purpose[265], intention[266], drafting history[267] and other articles[268] of the CISG.

[257] The CISG, Article 11, supra note 170; see: **Honnold**, J. O. (1999). Uniform Law for International Sales under the 1980 United Nations Convention. 3rd ed. Kluwer Law International, p. 135.

[258] Article 13 does not contradict with the no form requirement rule. Its purpose is that to emphasize telegram and telex will always satisfy the 'writing' requirements of Article 21(2) and 29(2), which are about means of contract modification. **Hill**, J. E. (2003). The Future of Electronic Contracts in International Sales: Gaps and Natural Remedies under the United Nations Convention on Contracts for the International Sale of Goods. Northwestern Journal of Technology and Intellectual Property, 2(1), 1-34, p. 16.

[259] Such as smart contracts, contracts concluded via e-mail or EDI, click-wrap and shrink-wrap agreements.

[260] **Hill**, p. 3.

[261] "*The provisions of this Convention apply to the use of electronic communications in connection with the formation or performance of a contract or agreement to which any of the following international conventions, to which a Contracting State to this Convention is or may become a Contracting State, apply: ... United Nations Convention on Contracts for the International Sale of Goods (Vienna, 11 April 1980).*" EC Convention, supra note 180, at Article 20(1).

[262] Article 8 of the EC Convention, supra note 180.

[263] **Mazzotta**, F. G. (2007). Notes on the United Nations Convention on the Use of Electronic Communications in International Contracts and Its Effects on the United Nations Convention on Contracts for the International Sale of Goods. Rutgers Computer and Technology Law Journal, 33, 251-298, p. 257; See U.N. Doc. A/CN.9/608/Add.1.

[264] As well as EC Model Law (1996), supra note 180.

The PICC embraces a flexible approach with regards to the manner of formation, providing that, "*A contract may be concluded either by the acceptance of an offer or by conduct of the parties that is sufficient to show agreement*[269]". Thus, apart from the traditional offer and acceptance method, the intent to be legally bound can also be ascertained from different statements or acts of a party (e.g. payment of the price, shipping of the goods, etc.). Moreover, the PICC does not provide any terms regarding to what is needed to be included in the offer for it to be sufficiently definite. At this point, undetermined conditions can be determined by analyzing the agreement based upon the implied intentions of the parties and the applicable law. Hence, the absence of some elements does not automatically make the contract invalid[270]. More importantly, it is explicitly stated in the comment section of the legislation that the language of the foregoing article encompasses automated contracting, in which the conclusion of a contract is consummated without the intervention of a natural person[271]. If no common intention of the parties can be established, the understanding of a reasonable person prevails[272]. Consequently, the PICC provides a favorable legal framework for the formation of smart contracts.

2) Country Analysis: Smart Contracts in Particular Jurisdictions

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[265] Excluding any type of formal requirement would facilitate the transaction speed and therefore, international trade. This is in line with the core purpose of the CISG.

[266] There is no indication of any intention to "*exclude any specific kind of communication*". **Eiselen**, S. (1999). Electronic Commerce and the UN Convention on Contracts for the International Sale of Goods (CISG) 1980. EDI Law Review, 6, 21-46, p. 28.

[267] If the contracting methods really mattered, the drafters would have included some provisions about them. Instead, they prepared a flexible, expanding document.

[268] See: **Hill**, pp. 21-27.

[269] Article 2.1.1, supra note 171; in the same vein, there is no form requirement. A contract may be proved by any means, including witnesses. Article 1.2, supra note 171.

[270] **Kolvart** (et al.), pp 140-141.

[271] Id, comment 3.

[272] Article 4.1, supra note 171.

In the following sub-sections, we are going to scrutinize whether or not smart contracts can give rise to legally binding contractual relations under the contract laws of USA and France. This will enable us to conduct a comparative legal study and show that the answer will vary depending on the jurisdiction and the smart contract type. In order to not fall into repetition, we will not explain the basic contractual elements again; however, we will examine every jurisdiction based upon its unique characteristics, which will affect smart contracts' legal status.

A) A Common Law Example: The United States of America (USA)

USA is currently one of the prominent jurisdictions in the world, in terms of the blockchain regulation. Following sub-sections will examine recent bills which were enacted by various states, and will discuss both the legislative framework for electronic contracts and the formation of smart contracts, in a generalized manner, due to the fact that contract law varies state to state.

a) Recent Developments across USA

In particular, the blockchain and smart contract legislation is a very hot and debatable topic across the United States (U.S.). While the states of Arizona[273], Tennessee[274], Vermont[275],

[273] As a blockchain-friendly state, Arizona passed its first bill which defines the roles and statues of blockchain, cryptocurrencies, digital signatures and smart contracts on DLT, in May 2017. Smart contracts are 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*". House Bill 2417, available at: https://legiscan.com/AZ/text/HB2417/id/1497439 (last visit: 30.4.2018); on April 3, 2018, a new bill was signed as an amendment to the Arizona Revised Statutes, which already allows "*signatures and records secured through blockchain technology and smart contracts*". Now, additionally, data stored and shared by the corporations on the blockchain, is also deemed valid. House Bill No. 2603, available at: https://legiscan.com/AZ/text/HB2603/id/1775893 (last visit: 30.4.2018); apart from these, new proposals which allow paying taxes with Bitcoins and recognize cryptocurrencies as a currency rather than a commodity, are on the way. **Coleman**, L. (February 9, 2018). Blockchain-Friendly Arizona Moves to Allow Bitcoin Tax Payments. Available at: https://www.ccn.com/bitcoin-friendly-arizona-moves-to-allow-bitcoin-tax-payments/ (last visit: 30.4.2018).

[274] The bill passed on the 26th of March, 2018, recognizes the legal authority to use DLT and smart contracts in conducting electronic transactions, and protects ownership rights of "*certain information secured by blockchain technology*". The bill ensures that no transaction will be denied in terms of legal effect, validity, or enforceability, merely because the contract includes a smart contract term. The definition of the smart contracts is nearly word-by-word same with Arizona's approach. Senate Bill No. 1662. Available at: http://www.capitol.tn.gov/Bills/110/Bill/SB1662.pdf (last visit: 30.4.2018).

Delaware[276] and Nevada[277] have passed bills regarding to the legal status of the blockchain technology and smart contracts, and while similar bills are pending in Hawaii, Nebraska and Maine, it is highly controversial whether such a state-by-state regulative approach is useful.

Antagonists of the regulation-savvy approach argue that the existing legal framework provided by the federal Electronic Signatures in Global and National Commerce Act (ESIGN Act)[278] and the Uniform Electronic Transactions Act (UETA)[279], is sufficient to provide a legal basis for the smart contract technology and executing the terms of a legal contract[280]. They claim that these two legal instruments are only inadequate for very specific legal situations such as wills, official court documents and documents related to family law issues[281]. However, in such circumstances and in many cases, a legal effect is given by other

[275] Incorporated in the economic development bill, state of Vermont recognized that "*a fact or record*" verified through the blockchain technology is "authentic", in other words, admissible as evidence. The Governor signed this bill on June 2, 2016. H.868. Available at: https://legislature.vermont.gov/assets/Documents/2016/Docs/ACTS/ACT157/ACT157%20As%20Enacted.pdf (last visit: 30.4.2018).

[276] Delaware Senate Bill 69 (signed on July 21, 2017) allows corporates, based in Delaware, to use "*electronic networks or databases*" which encompass distributed ledgers, in order to prepare stockholders' list and stock transfer records. Senate Bill No. 69. Available at: https://legis.delaware.gov/BillDetail/25730 (last visit: 30.4.2018); the records saved on distributed ledgers is regarded as, "*valid and admissible in evidence (…) to the same extent as an original paper record*". Delaware Code, Title 8, Chapter 1, §224.

[277] With the Senate Bill 398 signed into law on June 5, 2017, the state of Nevada provided a flexible definition of blockchain under the state's Uniform Electronic Transactions Act. Therefore, the certainty about how blockchain agreements and smart contracts will be handled under the law has been increased. Another important aspect is that local governments do not have any authority to impose any additional taxes or fees with regards to the use of blockchain. Senate Bill No. 398. Available at: https://www.leg.state.nv.us/Session/79th2017/Bills/SB/SB398_EN.pdf (last visit: 30.4.2018).

[278] Full text is available at: https://www.gpo.gov/fdsys/pkg/PLAW-106publ229/pdf/PLAW-106publ229.pdf (last visit: 30.4.2018).

[279] Full text is available at: http://www.uniformlaws.org/shared/docs/electronic%20transactions/ueta_final_99.pdf (last visit: 30.4.2018); States such as New York, Washington and Illinois have not enacted the UETA. However, they ratified alternative statutes which permits and regulates electronic contracts and signatures.

[280] **Chamber of Digital Commerce**, p. 2; see also: **O'Shields**, p. 189.

[281] **Kim**, A. D., **Boring**, P. (February 26, 2018). State-by-State Smart Contract Laws? If It Ain't Broke, Don't Fix It. Available at: https://www.coindesk.com/state-state-smart-contract-laws-aint-broke-dont-fix/ (last visit: 30.4.2018).

laws; and consequently, additional state laws are deemed largely unnecessary and as a source of confusion for the application of the existing law[282].

On the other hand, regulating blockchain law is obviously more than just responding to any legal problem which derives from the blockchain technology. Government representatives of the blockchain-friendly states, have different incentives to regulate. Regulation is seen as a tool of signaling to the market in a way to indicate that their state is open to technological innovation and they pursue an aim to be an innovation hub[283]. With making possible of enjoying the benefits of innovative law and technology, these officials are trying to relocate large technology companies and attract entrepreneurs to choose their state as a place of business[284]. Despite the fact that regulatory endeavors got a good reaction from entrepreneurs; before reaching to a conclusion on which approach seems more accurate, we still have to wait for widespread practical implications of these regulations, as the big portion of the bills are still brand new.

b) The U.S. Legislative Framework for Electronic Transactions

While the internet technology was burgeoning, states enacted different laws to cater the needs of consumers and businesses. In response to eliminate this fragmented and often contradictory legal structure, the National Conference of Commissioners on Uniform State Laws (NCCUSL) designed a model law, UETA, in order to harmonize the laws which govern electronic commerce transactions[285]. However, UETA was not successful to reach the

[282] **Chamber of Digital Commerce**, p. 2; contradictory court judgements support this idea. For example, in July 2016, a Florida state court ruled that Bitcoin is not a currency, while a Southern District of New York decision in September 2016, interpreted Bitcoin as a currency. **Cohen**, L. R., **Dewey**, J. N., **Larsen**, K. S. (August 30, 2017). Smart Contracts: Navigating Legal, Regulatory and Consumer Protection Issues. Strafford, p. 14. Available at: http://media.straffordpub.com/products/smart-contracts-navigating-legal-regulatory-and-consumer-protection-issues-2017-08-30/reference-materials.pdf (last visit: 30.4.2018).

[283] State senator (Vermont) Becca Balint emphasized that she and the other legislators evaluate the bill as openness to technological innovation and they are hopeful that it will help the recognition of Vermont as an innovation hub among the people. **Higgins**, S. (May 17, 2016). Vermont is Close to Passing a Law That Would Make Blockchain Records Admissible in Court. Available at: https://www.coindesk.com/vermont-blockchain-timestamps-approval/ (last visit: 30.4.2018).

[284] **Hyman**, G. M., **Digesti**, M. P. (2017). New Nevada Legislation Recognizes Blockchain and Smart Contract Technologies. Nevada Lawyer (August 2017), 13-17, p. 13.

[285] Summary of the UETA: http://www.uniformlaws.org/ActSummary.aspx?title=Electronic%20Transactions%20Act (last visit: 30.4.2018).

harmonization aim[286] and the Congress took initiative by passing the ESIGN Act, which is similar to the UETA, yet diverging in some provisions such as consumer consent requirements. The Congress set the states free to opt in for the ESIGN Act compliance or the UETA adoption[287]. All in all, the UETA and the ESIGN Act are two main legal instruments governing electronic transactions in USA.

As electronic records and signatures are vested with the same legal validity as physical documents and signatures, both instruments share some similarities. This legal status is provided in two steps: First, both guarantee that a signature or record will not be held legally ineffective on the grounds of its electronic form[288]. Second, both held that an electronic signature will be regarded as an equivalent of a written signature for any law, and that electronic records will be deemed as records in writing[289]. As a result, this approach not only acted as a means to facilitate digital transactions; but also to help the digital economy to grow in time.

Under all aforementioned circumstances, in the context of smart contracts, courts should take the relevant legislation and digitally signed contracts as a roadmap. Accordingly, smart contracts would probably comply with the requirements of federal and state law governing electronic transactions. For example, UETA is very liberal in terms of providing plenty of electronic means of manifesting intent to a contract, including "*an electronic sound, symbol or process attached to or logically associated with a record and executed or adopted by a person with the intent to sign the record*[290]". Therefore, an electronic signature consists of two components: whatever form of signature and the intent to sign[291]. The upshot is that

[286] The reason is that the application was inconsistent because states changed some provisions to adapt their law or protect consumers. See: **Cohn**, **West**, **Parker**, p. 286.

[287] 15 U.S.C.A. § 7002- Exemption to preemption. Available at: https://www.law.cornell.edu/uscode/text/15/7002 (last visit: 30.4.2018).

[288] 15 U.S.C.A. § 7001: UETA § 7(a).

[289] Id.

[290] UETA, § 2(8).

[291] **Cohn**, **West**, **Parker**, p. 288.

digital signatures using public or private key cryptography, should fall squarely with both the language and intent of ESIGN and UETA as constituting an "*electronic signature*[292]".

c) Smart Contracts' Formation under the U.S. Law

In the U.S., because the legal system is built on federalism, contract laws vary state to state. Notwithstanding that common law principles[293] are still valid in terms of contract formation, transactions for sale of goods are generally governed by the UCC, which is adopted and modified by the individual states. In order to establish an enforceable contract, basic contract principles, at its core, require "*an offer and acceptance, meeting of the minds, and consideration*[294]".

In that regard, one tricky issue for smart contracts' formation is showing the mutual assent. Manifestation of this assent is based on the traditional offer-acceptance mechanism[295] and this assent must be shown by making a promise and/or rendering performance[296]. According to the U.S. case law, this concept remains same in the electronic age as well[297]. Therefore, it would be accurate to examine the concept of mutual assent in terms of "*click-wrap*" agreements since smart contracts may evolve as click-wrap agreements in practice[298]. A click-wrap agreement is one formed over the internet; which a party posts terms and conditions and the other one performs a positive and conscious act such as clicking an "*I*

[292] **Cieplak**, J., **Leefatt**, S. (2017). Smart Contracts: A Smart Way to Automate Performance. Georgetown Law Technology Review, 1(2), 417-427, p. 426; **Cohn**, **West**, **Parker**, p. 288.

[293] Although these principles arose out of English common law, they evolved and gained a unique characteristic.

[294] May v. Anderson, 119 P.3d 1254, 1257 (Nev. 2005).

[295] Restatement (Second) Of the Contracts, § 22(1).

[296] Restatement (Second) Of the Contracts, § 18; however, it is impossible to establish a general principle with regards to whether certain acts or conduct form a binding contract - each situation must be evaluated on a case-by-case analysis. Johnson v. Capital City Ford Co., 85 So. 2d 75, 86-87 (La. Ct. App. 1st. Cir. 1955).

[297] Even though internet commerce has been presenting novel situations, it has not "*fundamentally changed the principles of contract*", including the "*mutual manifestation of assent*". Nguyen v. Barnes & Noble, Inc., 763 F.3d 1171, 1175 (9th Cir. 2014). As cited in: **O'Shields**, p. 186, footnote 76.

[298] "*Contracts entered into on internet typically fall into either clickwrap or browsewrap categories*". **O'Shields**, p. 186.

agree" button[299]. The U.S. courts recognize these agreements as enforceable, on the basis that parties do not have an obligation of considering and negotiating every single term[300]. If a party cannot proceed unless clicking the "*I agree*" button, thereby clicking that button, indicates his/her assent to be bound by the terms of the agreement[301]. Moreover, it is a general rule that a party who signs a legal instrument cannot later complain that he did not read the terms and conditions or did not understand the legal instrument's content[302]. Thus, users have a duty to read the terms before manifesting their assent. Nevertheless, worrying about unequal bargaining power, courts have developed some restrictive criteria, especially about standard form contracts which have an important place for commercial and consumer contracts related to the transfer of goods and services, in modern economies. Click-wrap agreements usually work on a "*take-it-or-leave-it*" basis, which means that standardized terms are a very frequent phenomena in that context. Accordingly, notice of the existence of a term before agreeing upon it is required by the courts[303] and an opportunity to read the terms of a contract must be given[304]. In that sense, to decide on whether a party entered into a click-wrap agreement consciously subsequent to a sufficient notice, courts take the "reasonable person" as a benchmark under the objective theory and take into consideration that "*(…) how conspicuous of the term is, whether and the extent of the course of dealing, and industry practice*.[305]"

[299] "*A click-wrap license presents the user with a message on his or her computer screen, requiring that the user manifest his or her assent to the terms of the license agreement by clicking on an icon*". Specht v. Netscape Communications Corp., 150 F. Supp. 2d 585, 587 n. 1. (S.D.N.Y. 2001) at 593-594.

[300] An R3 and Norton Rose Fulbright White Paper, p. 27; See, e.g., Hill v Gateway 2000, Inc, 105 F.3d 1147, 1150 (7th Cir. 1997).

[301] Steven J. Caspi, et al. v. The Microsoft Network, L.L.C., et al., 1999 WL 462175, 323 N.J. Super. 118, 732 A.2d 528 (N.J. App. Div., July 2, 1999).

[302] "*Our Court (…) stated the general rule that a party who signs an instrument manifests his assent to it and cannot later complain that he did not read the instrument or that he did not understand its contents. Here, plaintiff effectively "signed" the agreement by clicking "I agree" not once but twice. Under these circumstances, he should not be heard to complain that he did not see, read, etc. and is bound to the terms of his agreement*". Groff v. America Online, Inc., File No. C.A. No. PC 97-0331, 1998 W L 307001 (R.I. Superior Ct., May 27, 1998).

[303] Register.com, Inc v Verio, Inc, 356 F.3d 393, 403 (2d Cir. 2004).

[304] Nickens v. Labor Agency of Metro. Washington, 600 A.2d 813, 817 n. 2 (D.C. 1991).

[305] An R3 and Norton Rose Fulbright White Paper, pp. 27-28; Schnabel v Trilegiant Corp, 697 F.3d 110, 121–22 (2d Cir. 2012).

Another essential contractual element under the U.S. law is "consideration". A legally binding contract must comprise of an agreement of exchange of promises, an exchange of a promise for a performance or an exchange of performances. This is the concept which defines a bargain[306]. Consideration might be anything of value; however, merely giving a gift to someone would not constitute a binding contract[307]. Nevertheless, smart contracts offer a solution for the problem of uncertainty of gift-promises by allowing both the promiser and promisee the ability to encode the terms and ensure the execution, eliminating risk of divergence from the promise during the period in between the conclusion of the contract and execution time[308].

d) Status of the "Follow-on" Smart Contracts Concluded by Electronic Agents under U.S. Law

When it comes to the legal status of follow-on smart contracts, in spite of the U.S. case law, which provides plenty of examples that can be taken as a basis for interpretation, there is no clear answer which exists yet. Under the UETA, electronic agent means "*a computer program or an electronic or other automated means used independently to initiate an action or respond to electronic records or performances in whole or in part, without review or action by an individual*[309]". Since machines (electronic agents) do not have a legal personality and consequently a legal capacity, they cannot enter into agreements in their own right. The main question is whether acts of autonomous electronic agents are sufficient enough to express parties' intent to enter into an agreement. If the entire process is being automated, there is a possibility of one party or both parties to not even be aware of the transactions which are going through the system.

In order to examine this issue, let's take a hypothetical example. Assuming that we are dealing with a jurisdiction such as USA, which recognizes contracts which are formed electronically; According to predetermined parameters by a previous agreement, when the

[306] Restatement (Second) of Contracts § 3 (1981).

[307] "*There was no legal benefit to the promisor nor detriment to the promisee, and thus no consideration*". Congregation Kadimah Toras-Moshe v De Leo, 540 N.E.2d 691, 692 (1989).

[308] **Raskin**, p. 323.

[309] UETA, § 2(6), supra note 288.

customer's stock level of a certain good drops below a certain threshold, if the supplier has the enough number of goods in his stock, the system scans both stocks and automatically forms a new contract and executes it. In this case, it is likely that the traditional offer-acceptance mechanism exists; since invitation to treat, an offer to sell, and a communication of acceptance is made. Moreover, consideration requirements are also fulfilled, due to exchange of value between the parties. However, the problem is about the intention to create legal relations. The reason is that all declaration of intents is automatically created and sent. This situation also creates serious problems for legality of Internet of Things, which directly enables machine-to-machine contracts.

In our opinion, to determine whether the follow-on agreement reflects the parties' intention, a case-by-case analysis is required. This approach also seems in line with the U.S. case law which does not show a consensus on this subject. For example, in a case related to an insurance company's liability to cover a car accident, the court ruled that the computerized reinstatement of the insurance policy "*was the direct result of the errors and oversights of State Farm's human agents and employees. The fact that the actual process of the policy was carried out by an unimaginative mechanical device can have no effect on the company's responsibilities for these errors and oversights*[310]". Conversely, in another case, a federal court ruled that "*an automated, ministerial act*", such as giving an order tracking number, merely does not constitute an acceptance in the context of contract law[311]. Consequently, a flexible approach seems more appropriate as common law courts follow with regards to contractual disputes in time. Bearing in mind that the software does not act independently but only executes previous human decisions within the limits of predetermined boundaries[312], follow-on agreements are not *per se* unenforceable. At this point, evaluation benchmarks might be including but not limited to whether both parties had an ample opportunity to review the contractual terms (including the computer logic underlying it) and whether they were fully

[310] An R3 and Norton Rose Fulbright White Paper, p. 28; State Farm Mut. Auto. Ins. Co. v Bockhorst, 453 F.2d 533 (10th Cir. 1972).

[311] Id, p. 28; Corinthian Pharmaceutical Sys., Inc v Lederle Labs., 724 F. Supp. 605, 610 (S.D. Ind. 1989).

[312] **Mik**, E. (2013). Certainty at Last? A "New" Framework for Electronic Contracting in Singapore. Journal of International Commercial Law and Technology, 8(3), 160-178, p. 174; Mik also argues that parties manifested their intention in the first place by encoding the terms, and there is no need to refer to all future transactions. Id, p. 174.

aware of the possible consequences of their choice. Therefore, pursuant to this criteria, the answer will be mainly depended on whether the parties exercised necessary due diligence to the smart contract.

e) Conclusion

As we discussed the U.S. case law, the U.S. courts seem to be open for giving legal recognition for automated contracting (including follow-on agreements), limited to appropriate circumstances. Until new set of regulations or principles have been established, existing legal frameworks will be guiding both courts and practitioners. Fortunately, the traditional offer-acceptance mechanism and the concept of consideration is not problematic in the context of smart contracts. On the other hand, it is a high possibility for courts to develop new standards pertaining to manifestation of assent for concluding smart contracts, as this was the case for the click-wrap and the shrink-wrap agreements. Currently, although the U.S. courts are willing to attribute the actions of a software program to the person or organization consciously utilizing it, parties should be careful due of the fact that currently, there are no certain standards on "*what affirmative steps of assent the parties take, what terms the parties can access, how accessible the terms are, and the connection of the parties' control over an electronic agent acting on their behalf*[313]".

B) A Civil Law Example: France

As a blockchain-friendly country and one of the pioneers in Europe in terms of introducing financial regulation for DLT[314], France is an interesting case study. Following sub-sections will to examine recent developments in the French legal system and discuss the legislative framework for electronic contracts as well as the smart contracts' formation.

a) Recent Developments in French Legal System

So far, French lawmakers mainly have been concentrated on blockchain technology in the context of the financial sector. It is not a surprise when we bear in mind that France has a long-standing history in terms of digitizing its financial sector and financial supervisory

[313] An R3 and Norton Rose Fulbright White Paper, p. 29.

[314] Or, dispositive d'enregistrement électronique partagé (DEEP), as it is in French.

authorities have always been proactive to respond to new technological developments[315]. However, no case law exists about blockchain yet.

In the pursuit of taking the lead in financial innovation, France adopted two legal bills recognizing the DLT, in 2016[316] and in 2017[317], and defined the blockchain technology as a "*shared electronic registration technology*[318]". These legal instruments deal with the use of blockchain as a method to efficiently record financial and other instruments and to enhance their ownership authentication[319]. When it comes to their content, the Ordinance dated April 28, 2016 designates the opportunity to hold and/or transfer certain types of commercial paper, which the characteristics of them are described by an implementing decree dated October 28, 2016. On the other hand, Law n°2016-1691 of December 9, 2016 (art. 120), empowers the French government to specify rules that would permit for the holding and/or transfer of non-listed securities with the use of blockchain system. Pursuant to this article, the French government shall use this authorization by issuing an ordinance, and to this respect, the French Treasury commenced a public consultation process[320] at the end of March 2017 in order to involve all stakeholders and seek contribution from them. This ordinance on the use of a shared electronic recording device for the representation and transmission of financial securities (namely "*the DLT Order*"), has been published on December 8, 2017. However, the

[315] In that sense, in France, holding of securities are all dematerialized (including computerized back office business) since 1984 and that being said, electronic trading and settlement was introduced in the late 80s. **Jones Day Law Firm** (November, 2017). Blockchain for Business: White Paper, p. 10.

[316] Ordonnance n°2016-520 of 28 April 2016, completed by the Décret n° 2016-1453 of 28 October 2016.

[317] Law n° 2016-1691 of 9 December 2016; Ordonnance n°2017-1674 of 8 December 2017.

[318] **Blemus**, S. (2018). Law and Blockchain: A Legal Perspective on Current Regulatory Trends Worldwide. Revue Trimestrielle de Droit Financier (Corporate Finance and Capital Markets Law Review) RTDF N°4-2017, p. 12.

[319] France finance minister Bruno Le Maire argued that "*The use of this technology will permit fintechs and other financial actors to offer new solutions for exchanging securities, solutions that are faster, cheaper, more transparent and more secure*". **Makadiya**, A. (December 10, 2017). Blockchain-Friendly France Changes Laws to Transform Securities Trading. Available at: https://www.bitsonline.com/france-blockchain-friendly-securities/ (last visit: 30.4.2018).

[320] **DG Trésor / Finent** (March 24, 2017). Public Consultation on Planned Legislative and Regulatory Reforms Relating to Blockchain Technology. Available at: https://www.tresor.economie.gouv.fr/Ressources/File/435107 (last visit: 30.4.2018).

DLT Order is still not in force due to a pending decree which will specify its technical conditions by July 1, 2018, at the very latest[321].

Another important legal development concerning smart contracts' status is the Civil Code Reform, which was completed in 2016. It was a huge milestone for France, because the French Civil Code has been the main private law instrument -without undergoing a comprehensive change- for more than two centuries, since its enactment in 1804. It was a source of national pride for the French people and even Napoleon described it as his real glory[322]. Yet, notwithstanding that the code becomes outdated and loses its international influence, one important reason which induced French lawmakers to accomplish this reform is that criticisms about existing code's lack of attraction for international businesses as some common law countries provide[323].

In order to adapt the code to the necessities of the time, alongside with codifying the existing case law, the reform brought a completely new sub-section regulating contract formation, which is used only to comprise of judge-made rules[324]. With changes such as the exclusion of the controversial notion of "cause[325]" for contract formation, the French

[321] **Blemus**, p. 12.

[322] "*My real glory is not to have won forty battles: Waterloo will erase the memory of all these victories. What nothing will erase, what will live eternally, is my Civil Code"*. **De Montholon**, C. T., Récits de la captivité de l'Empereur Napoléon à Sainte-Hélène (1847), Paulin, p. 401.

[323] From this point of view, the World Bank's 'Doing Business' report in 2006 is a good example. France was ranked 44th in terms of ease of doing business; following much less developed countries such as Botswana and Jamaica. The report emphasized influence of the French legal tradition on business and criticized it by depicting French civil law as economically inefficient, complex and unpredictable. **The World Bank and the International Finance Corporation** (2006). Doing Business in 2006: Creating Jobs. Available at: http://www.doingbusiness.org/~/media/WBG/DoingBusiness/Documents/Annual-Reports/English/DB06-FullReport.pdf (last visit: 30.4.2018); see also: **Rowan**, S. (2017). The New French Law of Contract. International and Comparative Law Quarterly, 66, 805-831, p. 809.

[324] This situation was portrayed as a "*major lacuna*" by some French scholars. **Chantepie**, G., **Latina**, M. (2016). La réforme du droit des obligations, Commentaire théorique et pratique dans l'ordre du Code civil. Dalloz, p. 139.

[325] Notion of cause consists of two different concepts: objective cause and subjective cause. Objective cause requires a real reciprocity (which usually occurs as a counter-performance) for every contract, which is regarded as the abstract goal of the contract. On the other side, subjective cause is about the subjective reasons, which induce the contracting parties to enter into such agreement. It should be a licit purpose. The incompliancy of both objective and subjective cause will constitute a basis for annulment of a contract. However, even though this formal requirement has been abandoned, new -clearly defined- rules have been introduced and can allow courts to reach similar decisions. See: **Rowan,** pp. 816-818.

lawmaker aimed to reduce court interference[326] and ease business. We are going to discuss the possible effects of these changes in the context of smart contracts' formation in the following sub-sections.

b) French Legislative Framework for Electronic Transactions

In EU countries, electronic signatures are regulated by the Regulation (EU) N°910/2014 on electronic identification and trust services for electronic transactions in the internal market (eIDAS Regulation[327]). The regulation was a part of EU's "*Digital Agenda*" and aims to create a European internal market for electronic trust services[328] by guaranteeing that they are going to be regarded valid across borders and benefit from the same legal status as traditional paper based versions. Therefore, certainty and European integration will be increased.

The French Civil Code[329] complies with the regulation and specifically permits concluding a contractual relationship by electronic means[330]. Pursuant to the relevant provision, "*writing consists of a series of letters, characters, numbers or any other signs or symbols with an intelligible meaning, whatever their medium*[331]". Therefore, there is nothing which prohibits the use of cryptographic means for entering into an agreement. Moreover, in

[326] In respect thereof, *Cour de Cassation* annulled a contract on the grounds of the promisee's commercial rationale: the court held that the contract was unrealistic and his commercial ambitions are unachievable. See: Video cassette decision: Civ (1) 3 July 1996, D 1997.500 note P Reigné.

[327] Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC. Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2014.257.01.0073.01.ENG (last visit: 30.4.2018).

[328] Namely; electronic signatures, electronic seals, time stamps, electronic delivery services and website authentications etc.

[329] Articles 1363-1368 of the Civil Code regulates this issue.

[330] "*Electronic writing has the same probative force as writing on paper, provided that it is possible properly to identify the person from whom it originates and that it is created and stored in such conditions as will guarantee its integrity*". Article 1366 of the Civil Code. **Cartwright**, J., **Fauvarque-Cosson**, B., **Whittaker**, S. (2016). The Law of Contract, The General Regime of Obligations, and Proof of Obligations: The New Provisions of the Code Civil Created by Ordonnance n° 2016-131 of 10 February 2016 Translated into English, p. 51. Available at: http://www.textes.justice.gouv.fr/art_pix/THE-LAW-OF-CONTRACT-2-5-16.pdf (last visit: 30.4.2018).

[331] Article 1365 of the Civil Code, supra note 330, p. 51.

B2B contexts, nothing limits parties to use any of the possible electronic means[332]. According to French case law, a contract might even be formed via email exchanges[333]. The upshot is that rules which govern electronic signature, is also applicable for smart contracts, and they might be formed validly if the parties fulfill the other conditions of the contract law.

c) Smart Contracts' Formation under French Law

Pursuant to new Article 1128 of the French Civil Code, formation of a valid contract requires three conditions: the consent of the parties, their capacity to contract and content which is lawful and certain[334]. In addition, apart from specific circumstances such as real estate ownership transfer, there is not any general formal requirement[335]; oral agreements are even valid as long as one party proofs the existence.

Although the terms of "*objet*[336]" and "*cause*[337]" were removed from the code's wording, the soul of these concepts remains under the general concept of "*content*". In a large extent, subjective cause is reshaped in article 1162, which regulates that "*a contract cannot derogate from public policy either by its stipulations or by its purpose (…)*[338]". Similarly, objective cause can also form its basis from article 1169, which provides that the benefit of an onerous contract cannot be illusory or derisory at the time of the conclusion[339]. As cause is firmly connected to the object of an obligation, identification of the subject matter of an obligation in a smart contract is essential to determine whether the smart contract is legally enforceable. For example, due to the mentality differences between the U.S. and the French

[332] An R3 and Norton Rose Fulbright White Paper, p. 40.

[333] Id, p. 40; French Supreme Court: Cass. 1re civ., 1st July 2015, n° 14-19.781; see also: Paris Court of Appeals: CA Paris, 4 February 2016, n°13-21057.

[334] Article 1128 of the Civil Code, supra note 330, p. 9.

[335] Only a specific class of contracts requires formality and they are named as "solemn" contracts. See: Articles 1172 and 1173 of French Civil Code, supra note 330.

[336] This connotes the determined or determinable object of the obligation.

[337] This connotes an existing and lawful cause of the obligation; similar to notion of consideration in common law legal systems.

[338] Article 1162 of the Civil Code, supra note 330, p. 13.

[339] Article 1169 of the Civil Code, supra note 330, p. 14.

legal systems, same smart contract might be approved by the US courts, whilst French courts might annul on the grounds of lack of objective cause. The reason is that the consideration threshold is lower in USA; the U.S. courts do not evaluate the adequacy of consideration, but evaluate whether it has been bargained for. Therefore, unlike French law, under specific circumstances, if a person promised to give another person his personal computer for $1.00 because he wants to get rid of it, then the amount of money might seem adequate and the smart contract regulating it might be regarded as legally binding. In brief, a smart contract which explicitly defines both parties' obligation in proper manner (either by means of a previous traditional paper-based contract encoded on a distributed ledger or directly drafted on such system), might be deemed legally binding pursuant to the French legal system.

The traditional offer-acceptance mechanism stays as a pillar of French contract law. However, the reform put forward a new pre-contractual general duty, which requires a party to provide information when it would be decisive for the counterparty's consent[340]. It is a significant criterion, especially for smart contracts drafted by one of the parties; due to the lack of information on the terms or *modus operandi* of the program which can lead to an annulment.

When it comes to the legal capacity, pursuant to French law, only natural or legal persons are entitled to enter into a contractual relationship. In case of smart contracts, the main issue is not revolving around the capacity, but about the identification. Since blockchain transactions can be made pseudonymous without requiring a trusted third party, based on lack of capacity, a contract might be annulled very later on when the parties' identity are revealed. In this regard, it should come as no surprise that regarding interest bearing notes, article L223-12 insists on authentication and security conditions in which a distributed ledger will operate in order to ensure that the transaction will be deemed as legally effective[341].

d) Status of the "Follow-on" Smart Contracts Concluded by Electronic Agents under French Law

Remained unchanged with the contract law reform, the French legal system permits the use of an agent or another kind of proxy for entering into contractual relations. In a similar

[340] Article 1112-1 of the Civil Code, supra note 330, p. 4.

[341] An R3 and Norton Rose Fulbright White Paper, p. 41.

position with the EU Contract Law[342], the French law considers the concept of agency, as being the substitution of one person with another. As a general civil law principle, since the agent is not acting on his own behalf, it is not a requirement for him to have a full legal capacity[343]. However, the controversial issue is that under the subjective theory, which is the traditional concept in France, the will of the parties is concentric with their inner mind. External manifestation has a value -only- as long as its compliance with the inner will[344]. However, the problem is that, in case of the electronic agents such as smart contract applications, it is not very easy to attribute an inner state of mind. Furthermore, another problem in terms of consent caused by the subjective theory is that, under French law, a party is only deemed to be bound by the terms of an agreement if that party had a chance to review its terms. In circumstances which one or two electronic agents have concluded a contract, we cannot speak of a review. Having said that, in accordance with the EU Directive, member states have to "*ensure that the legal requirements applicable to the contractual process neither create obstacles for the use of electronic contracts nor result in such contracts being deprived of legal effectiveness and validity on account of their having been made by electronic means*[345]". To provide compliance with this requirement, applying the objective theory as common law countries do, might offer a solution[346]. Thus, the consent would be regarded coming from the person using the electronic agent, and not the electronic agent itself.

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[342] "*For the purposes of this Directive, 'commercial agent' shall mean a self-employed intermediary who has continuing authority to negotiate the sale or the purchase of goods on behalf of another person, hereinafter called the 'principal', or to negotiate and conclude such transactions on behalf of and in the name of that principal*". Council Directive 86/653/EEC of 18 December 1986 on the coordination of the laws of the Member States relating to self-employed commercial agents. O.J. 196 L382/17. Article 1.

[343] **Carbonnier**, J. (1990). Droit Civil - 4. Les Obligations. Presses Universitaires de France, p. 223.

[344] Id, p. 72.

[345] Directive 2000/31/EC of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market. O.J.L178/1, 17.7.2000.

[346] In this regard, according to Allen and Widdison, in case of computer agreements, human intention does not have to lie behind the making of an offer or an acceptance. Human trader's generalized and indirect will to be bound by these agreements is sufficient to render it legally binding for the courts. **Allen**, T., **Widdison**, R. (1996). Can Computers Make Contracts? Harvard Journal of Law & Technology, 9(1), 25-52, p. 44; to the contrary, Kerr dissents and contends that, "*the objective theory of contract will not allow autonomous devices to escape doctrinal difficulties: sophisticated technologies notwithstanding, electronic devices are not legal persons; they lack the intellectual capacity to intend legal relations and cannot meaningfully be said to enter into agreement voluntarily*". **Kerr**, I. R. (1999). Providing for Autonomous Electronic Devices in the Uniform Electronic Commerce Act. Paper presented at Uniform Law Conference of Canada, p. 23.

In this manner, as we discussed under the U.S. law, it would be important for courts to detect whether both parties had an ample opportunity to review the contractual terms (including the computer logic underlying it) and whether they were fully aware of the possible consequences of their choice. If the contract fulfills requirements of contract law, it should not be deemed unenforceable merely because it was concluded by electronic agent(s).

e) Conclusion

In overall, smart contracts are neither *per se* legal nor illegal under French law; there are both enabling and restricting factors. However, it is important to bear in mind that the French government has been conducting a pro-active approach with regards to the regulation of the DLT, and enacting specific bills in order to enable contracting via distributed ledger in discrete applications.

C) Results of the Comparative Analysis

Our analysis leads us to a conclusion that due to the lack of a sufficient regulation, even if it is the case for pro-active regulators such as USA and France, the lack of case law and the possibility of a wide spectrum of smart contract models, makes it nearly impossible to reach a precise conclusion on the legal status of smart contracts'. A case-by-case analysis should be conducted with taking into account the relevant smart contract's type and the applicable law. On the other hand, what the parties can do in order to increase their chance to reach a legally binding agreement is observance of traditional contract law principles or just creating a wrapper by means of a traditional paper-based contract. Certainty as to parties' manifestation of their assent and what constitute the contractual terms, are very crucial issues. Moreover, even though initial smart contracts seem legally binding in overall[347], follow-on contracts may not give rise to a legally enforceable contract in some jurisdictions. Last but not least, formal requirements of jurisdictions would impede using smart contracts for particular transactions. For example, in most jurisdictions, it would be impossible to transfer ownership of a real estate via blockchain.

In brief, outcome of our analysis can be illustrated as follows:

[347] However, one should not overlook that the electronic nature of contracting might cause problems in some jurisdictions, although they do not constitute the majority.

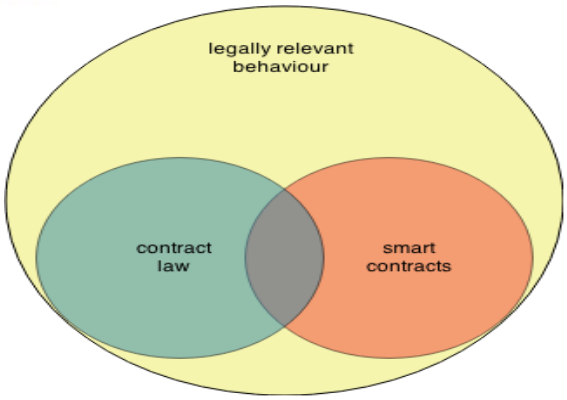

Figure II[348]: Schematic view of smart contracts under law

3) Conceptualizing Decentralized Autonomous Organizations (DAOs) under Business Law

As it was expressed in The DAO's whitepaper; "*(…) the legal status of DAOs remains the subject of active and vigorous debate and discussion. Not everyone shares the same definition. Some have said that they are autonomous code and can operate independently of legal systems; others have said that they must be owned or operate by humans or human created entities. There will be many uses cases, and the DAO code will develop over time. Ultimately, how a DAO functions and its legal status will depend on many factors, including how DAO code is used, where it is used, and who uses it*[349]". Accordingly, our paper only offers a general perspective on DAO related legal issues. However, legal consequences will be varying, depending on the jurisdiction and the organization structure.

There are many legal concerns threating the viability of DAOs and deterring investors from investing money on such projects: first of all, a DAO is not a verified legal person by governmental authorities, since it does not follow any incorporation process provided under current legal frameworks. This means that a DAO does not represent a legal person, who is entitled to enter into contracts. Therefore, further challenges arise as to the legal rights attributable to a DAO and who will be deemed responsible from a DAO's transactions.

[348] The figure is taken from: **Glatz**, F. (December 12, 2014). What are Smart Contracts? In Search of a Consensus. Available at: https://medium.com/@heckerhut/whats-a-smart-contract-in-search-of-a-consensus-c268c830a8ad (last visit: 30.4.2018).

[349] **Jentzsch**, C. (2016). Decentralized Autonomous Organization to Automate Governance (2016), p. 1. Available at: https://download.slock.it/public/DAO/WhitePaper.pdf (last visit: 30.4.2018).

Moreover, another threat for investors is that there is no rule enacted yet limiting the liabilities of DAO's users. Finally, due to the decentralized and digitalized structure, it is not easy to attribute a jurisdiction to a DAO and it might even be hard to identify the members at any particular point of time. Therefore, it does not only seem difficult to sue a DAO and claim remedies for its wrongful acts, but it will also be very difficult to properly assign ownership in the product of contracts as similar ambiguity also exists in terms of tokens: they are neither registered as securities nor shares[350]. In addition, Ethereum (ETH) is not regarded as a currency in most of the world's countries[351]. All in all, the law is basically unprepared for DAO's[352]. What courts will probably do is to attempt to classify a DAO legally, by using analogy, based on their structure and function, in comparison to other legally recognized entities.

a) Organizational Structure of a DAO

DAO is a novel type of organization which runs through rules encoded as smart contracts[353]. Despite the fact that there is no common standard that exists pertaining to the organizational structure of DAO's, with taking The DAO as a reference point, we can mention four different types of actors: the creators/ the congress[354] leaders of the platform, the curators, the contractors and token holders/ investors.

Creators are the people who wrote The DAO's open-source code, which designates the functions of The DAO and enables other people to join. Therefore, the creator can be regarded as responsible for operations. The importance of the code is that a DAO will operate pursuant

[350] Nevertheless, tokens might be reclassified as securities by public authorities and it constitutes a big risk for all DAO members.

[351] **Sameeh**, T. (March 26, 2017). Legal Aspects of DAO (Decentralized Autonomous Organization). Available at: https://www.deepdotweb.com/2017/03/26/legal-aspects-dao-decentralized-autonomous-organization/ (last visit: 30.4.2018).

[352] **Hinkes**, A. (May 19, 2016). The Law of The DAO. Available at: https://www.coindesk.com/the-law-of-the-dao/ (last visit: 30.4.2018).

[353] **Chohan**, U. W., The Decentralized Autonomous Organization and Governance Issues (2017). Discussion Paper Series: Notes on the 21th Century. Available at: https://ssrn.com/abstract=3082055 (last visit: 30.4.2018).

[354] "Congress" refers to the community, which consists of all DAO's members who are entitled to affect the outcome of a proposal. "Congress leader" refers to the member changing the voting rules. **Gudkov**, A. (2017). Legal Aspects and Distributed Character of the Decentralized Network Organization. Available at: https://ssrn.com/abstract=2911498 (last visit: 30.4.2018).

to rules set out by its code and unregulated by the code will be subject to input from DAO token holders. This also means that a DAO would require some vital external inputs such as investor capital and voting participation for the approval of the projects.

Curator is a concept introduced by The DAO, a participant with a duty of maintaining the code, offering changes to The DAO and "*white-listing*" other proposals. In this sense, a curator has two primary tasks: checking published contracts and approving that a proposal came from an identified person[355]. A curator also functions as a safeguard against "*Tyranny of Majority*", which describes the circumstances where an individual or a group controlling more than 50% of the total tokens tries to send all funds to themselves by abusing their power[356]. Curators are chosen by DAO participants to act as DAO's real world intermediary. At this point, it is important to state that the existence of a curator does not undermine a DAO's non-central management: notwithstanding that having more rights than other participants, curators only do a technical job. A curator cannot build a product, develop hardware or write a code. For this reason, some argue that "*clerk*" would be a more suitable term to describe this role, since curator has a strict definition as a legal term[357].

Contractors are the people who initiate proposals for the development of products or services, in return for investing The DAO's accumulated assets, ETH's. Manufacturing a product or services requires actors to operate in the psychical world; and contractors fill this gap for DAOs. Therefore, in other words, contractors can be defined as actors who perform tasks in the psychical world[358]. Contractors are easier to identify in comparison to other actors because they need to disclose the nature of the projects prior to voting. Proposals are usually written in simple English and backed by computer code in the form of a smart contract. Their

[355] **Tual**, S. (April 9, 2016). On DAO Contractors and Curators. Available at: https://blog.slock.it/on-contractors-and-curators-2fb9238b2553 (last visit: 30.4.2018).

[356] **Harrison**, D., **Allen & Overy LLP** (May 16, 2016). Decentralized Autonomous Organizations, p. 3. Available at: http://www.allenovery.com/SiteCollectionDocuments/Article%20Decentralized%20Autonomous% (last visit: 30.4.2018).

[357] **Roussel**, A. (May 14, 2016). The DAO, the Curators: Evaluating and Mitigating the Legal Risks. Available at: https://blog.bity.com/2016/05/14/the-dao-the-curators-evaluating-and-mitigating-the-legal-risks/ (last visit: 30.4.2018).

[358] **Harrison (et al.)**, p. 3.

content explains the relationship between The DAO and the contractor, including but not limited to deliverables, responsibilities and operating parameters[359].

When it comes to the investors/ DAO token holders, they are stakeholders in a DAO by exchanging ETH in lieu of DAO tokens. These tokens grant investors voting rights for the proposals initiated by contractors. Owing to pseudo-anonymous blockchain system, it is a big concern to locate and identify investors.

b) Legal Issues Concerning Tokens: A U.S. Law Perspective

DAO participatory tokens possess various characteristics and their legal status constitutes an important risk to investors. In one sense, they are a tool to access and vote in a technological experiment. On the other hand, they represent a monetary investment, having similar characteristics with a share or equity. In that regard, DAO tokens may be deemed as a form of equity which replace a company's board and chief executive officer (CEO) by introducing software and a consensus governance. Accordingly, SEC's report acknowledges that if tokens are regarded as a security, then token sales, or namely initial coin offerings (ICOs), will be subject to the federal securities law regulations[360]. However, it does not mean that all ICOs are going to be brought under securities laws; instead, SEC stresses that federal securities law may apply to various activities (regardless of operated via DLT or another technology, or form of the organization) depending on the particular facts and circumstances[361]. Consequently, for each project, a separate individual analysis is required.

According to Howey test[362], which was developed by the U.S. Supreme Court, in order to determine whether certain transactions are investment contracts and therefore subject to registration requirements, there are four cumulative[363] criteria. Assessments are being made

[359] **Levine**, M. (May 17, 2016). Blockchain Company Wants to Reinvent Companies. Available at: https://www.bloomberg.com/view/articles/2016-05-17/blockchain-company-wants-to-reinvent-companies (last visit: 30.4.2018).

[360] **SEC Press Release**, supra note 70.

[361] **SEC** (July 25, 2017). Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO, p. 10. Available at: https://www.sec.gov/litigation/investreport/34-81207.pdf (last visit: 30.4.2018).

[362] See: SEC v. Howey, supra note 246.

[363] "*To be considered a security, all four factors must be met*". SEC v. Edwards, 540 U.S. 398 (2004).

"*regardless of whether the shares in the enterprise are evidenced by formal certificates or by nominal interest in the physical assets used by the enterprise*[364]". Pursuant thereto, an "investment contract" is (I) an investment of money, (II) in a common enterprise, (III) with an expectation of profits, (IV) solely from the efforts of others. We will examine The DAO under these criteria and try to figure out why the SEC held that The DAO's tokens were securities. Notwithstanding that, the SEC has decided not to file any charge in this particular case.

The DAO's investors paid ETH in return for tokens. Although ETH is not money in strict sense, investment of money may comprise different types of value, not only capital, assets, cash but also goods, services, promissory notes etc[365]. In parallel with that, the SEC followed this approach in its investigation report by stating that ETH and other cryptocurrencies are equivalent to fiat currency in terms of the Howey test and subsequently this principle is reaffirmed by a U.S. court[366]. In the same vein, some argue that because investors expect a profit and there is a possibility of financial loss, the payment will be likely regarded as a "payment" component of an investment contract or a security[367].

About the "*commonality*" criterion, the SEC did not prefer to discuss it separately due to the fact that the funds of The DAO were pooled. The SEC held that it is a sufficient indication of commonality and did not delve into detail without explaining different commonality approaches[368] embraced by different judicial circuits.

As it was earlier mentioned, the third criterion is the existence of reasonable expectation of profit by investors. Again -without making any theoretical discussion- the SEC accepted this criterion as filled, by stating that "*(…) a reasonable investor would have been motivated, at least in part, by the prospect of profits on their investment of ETH in The DAO*".

[364] See: SEC v. Howey, supra note 246; "form should be disregarded for substance" Tcherepnin v. Knight, 389 U.S. 332, 336 (1967).

[365] See, e.g., Hector v. Wiens, 533 F.2d 429, 432-33 (9th Cir. 1976).

[366] The court ruled that investment of cryptocurrency (in this case, Bitcoin), passes the first requirement of the Howey test. SEC v. Shavers, No. 4:13-CV-416, 2014 WL 4652121, at *1 (E.D. Tex. September 18, 2014).

[367] **Hinkes**, supra note 352.

[368] Three dominant approaches can be counted as follows: horizontal commonality, narrow vertical commonality and broad vertical commonality.

However, the SEC could have made a functional assessment in order to decide whether primary expectation of the investors' is to profit. The takeaway is that tokens would be regarded as security even if investment is a secondary expectation. Conversely, under the functional approach, there is still a room for discussion on whether the primary expectation of the investors was to obtain access rights to an innovative platform, which would give them an opportunity to shape the future of DLT, instead of making profit. Proponents of the functional approach argue that circumstances which investors obtain tokens having utility on a platform (and investors pursue an expectation of using or consuming the item purchased instead waiting for profit) may locate tokens similar to a license or a use right, rather than security[369].

Fourth prong of the Howey test requires expectation of profits to be derived solely from the effort of others. Therefore, in our case, a comparison should be made between the efforts of Slock.it's co-founders (the creators), The DAO's curators and DAO token holders' voting rights. At this point, the core issue is "*whether the efforts made by those other than the investor are undeniably significant ones, those essential managerial efforts which affect the failure or success of the enterprise*[370]". In sum, the SEC held that the creators' and the curators' marketing and managerial efforts are significant, and due to the reason that the investors have to wait to sell tokens in secondary markets until a platform is built, may be an indication of investor reliance on others[371]. Moreover, the investors' voting rights are limited in relation to managing The DAO; the creators and the curators, have a vital position in monitoring the operation of The DAO, protecting investor funds, and deciding on whether proposals should be put for a vote. Last but not least, anonymity and dispersion of the DAO token holders made it very difficult to cooperate with each other or exercise meaningful control[372]. This was also seen during The DAO attack; token holders could not effectively cope with the circumstances without the assistance of the creators.

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[369] **Ledbetter**, A. D., **Dykes**, T. C. (July 31, 2017). SEC Report on Tokens as Securities: Seven Takeaways. DLA Piper: Capital Markets Alert. Available at: https://www.dlapiper.com/en/us/insights/publications/2017/07/sec-report-on-tokens-as-securities/ (last visit: 30.4.2018); different types of tokens can be offered via ICOs, and they can exist in the form of currency, security, coin, discount contract, loan, license etc.

[370] SEC v. Glenn W. Turner Enters., Inc., 474 F.2d 476, 482 (9th Cir. 1973).

[371] **Ledbetter**, **Dykes**, supra note 369.

[372] **SEC Investigation Report**, supra note 361, p. 14.

The bottom line is that participants[373] of ICOs should act carefully and make case-by-case assessment with taking into account all facts and circumstances since the SEC warned that unregistered, non-exempt offerings may face liability. In addition, ICOs usually take place globally (or at least in plenty of jurisdictions) and aforementioned explanations are only related to the U.S. federal securities law[374]. Participants who do not want to face liability must comply with all relevant jurisdictions.

c) Legal Status and Liability of a DAO

Under corporate law, a DAO is a typically incorporated entity and therefore traditional corporate shield protecting registered entities will probably not be applicable for participants of a DAO. Due to the complex characteristic of a DAO, only a narrow group consists of the creators and the curators capable of understanding technological features and, in connection with that, system limitations and possible future outcomes are similar with an investment fund. Despite that there is no registration procedure for a DAO, the management company (also being called as service company) has to be registered and licensed, and more complicated issues arise when notions of a DAO and founders' company merges.

In light of the foregoing explanations, DAOs will probably be considered as a kind of general partnership[375], joint venture[376] or "unincorporated association"[377]. In a general partnership scenario, any partner (which of those participants will be in scope of the definition

[373] The SEC did not provide a description of what constitutes participation in an ICO. However, the term may include a wide-range of people who drafts white paper, designs a web page for ICO, or soliciting investors. **Ledbetter**, **Dykes**, supra note 369.

[374] Even within USA, some states have their own securities registration requirements which are named as "Blue Sky Laws" and these requirements may change the outcome whether the tokens are considered securities or not.

[375] Some argue that DAOs cannot be classified as general partnership, since the connection between investors are very weak due to pseudonymity and they cannot prevent anyone from becoming a token holder. This conflicts with one of the prominent features of a general partnership: in a partnership, existing partners usually have a discretion on to decide whether bringing in new partners or not. Moreover, even though a partnership may be formed by conduct, it is alleged that this is not the case for The DAO example, since The DAO was not capable of operation without human help. However, it would not be wrong to say that this is a minority view and DAOs are usually considered as a general partnership. **Bramanathan**, R. (June 24, 2016). Blockchains, Smart Contracts and the Law: Unravelling the Legal Issues Surrounding The DAO. Available at: https://blog.coinbase.com/blockchains-smart-contracts-and-the-law-709c5b4a9895 (last visit: 30.4.2018).

[376] Especially for the tax law purposes it is being recommended to treat DAOs as a joint venture. See: **Wardynski and Partners** (October 27, 2016). Blockchain, Smart Contracts and DAO, pp. 30-32.

[377] Id, p. 5; **Hinkes**, supra note 215.

remains ambiguous) can represent the DAO and may be sued and held joint and severally liable from its debts. This case serves plaintiffs interests and constitutes a great risk for investors. If a DAO is considered an unincorporated association, an in-depth analysis is required, but a participant may be deemed as a representative of the association depending on the level of control over the association is established[378]. Even though a DAO would provide extensive rules governing its conduct between internal members, the rules will be hardly useful when interacting with an external jurisdiction[379]. Moreover, tracing liability to members[380] across jurisdictions may be problematic and courts may opt for to find liability against the developer, promoter or creator of the DAO. In that regard, DAO's legal representative can be identified on the basis of marketing efforts. A DAO's actual representative, who recruits new investors and/or promotes the merits of investing in the DAO project, is also its legal representative. In the absence of such authority, the promoter may be sued for misrepresentation.

When it comes to determining the jurisdiction to sue a DAO, since their digital non-domiciled structure, the geographical approach is not suitable. Nevertheless, in case of a tort or delict, the place of events principle (*the lex loci delicti commissi*) may be applicable to determine the jurisdiction[381]. However, the most feasible approach to determine a DAO's jurisdiction is grounding on its creator (congress leader) and the service company. There is a high probability of DAO's ordinary transactions which are undertaken on its own behalf will be attributed to its incorporated service company, depending on the context and the cause of action.

In circumstances such as The DAO attack, investors will have various legal options to claim remedies against The DAO and the exploiter. The most crucial issue in order to

[378] **Hinkes**, supra note 215.

[379] **Harrison (et al.)**, p. 5.

[380] Anyone (legal, natural or even digital person) who invested ETH in return for tokens, is a member of the DAO.

[381] **Gudkov**, p. 6; with regards to the applicable law, the author states that the law of the place where the property is located (lex loci rei sitae) cannot be applied, since the assets of a DAO will be spread all around the globe. Instead, he recommends to determine the applicable law on the basis of jurisdiction of the other contractual party; the judge can apply the law of where the contract was concluded (*the lex loci contractus*) or the place where the contract was completed (lex loci solutionis).

determine the most lucrative way is finding out whether there is a legally binding contractual relationship which exists between the investors and The DAO under the applicable law. For example, under the U.S. law, depending on some specific legal theories, a theft or conversion claim, breach of bailment claim, tortious interference claim or a claim arising from the Computer Fraud and Abuse Act (CFAA) may provide relief against the exploiter[382]. However, some legal solutions against the exploiter may only be used by The DAO itself, due to the problems related to representation. Therefore, the upshot is that providing a specific legal personality and status for DAOs (and for some of their specific actions, like hard-forking) might be helpful to prevent future complications. Otherwise, until regulation catches up with innovation, DAOs will probably continue to employ a service company mechanism or a similar method, in order to effectuate physical world interactions with third parties. Indeed, this is not a very efficient mechanism due to indirectness[383], and the link between two entities would not be recognized by each and every jurisdiction.

Finally, establishing special online dispute resolution systems may significantly reduce all foregoing legal uncertainty and augment development of DAOs by improving stakeholders' confidence. As DAOs, their dispute resolution should be borderless as well. In that sense, projects like Decentralized Arbitration and Mediation Network (DAMN)[384] are of vital importance for robustness of future DAO enterprises. Authors of the DAMN project envisage a mechanism, which is going to operate in compliance with the New York Convention, with an aim to ensure that the decisions would be automatically enforceable in more than 150 countries around the world[385]. The co-creator describes the DAMN as a kind of "*opt-in justice system for commercial transactions*[386]," which is going to provide all advantages of arbitration by allowing parties to choose -depending on circumstances and their will- whether their dispute is going be resolved by a person, an algorithm, pools of random jurors, pools of

[382] **Hinke**s, supra note 215.

[383] For example, a successful action against the service company would be limited to whatever assets the company holds at that moment.

[384] For detail, see: **Morgan**, P., **Antonopoulos**, A. M., DAMN Research and Project Proposal, available at: https://github.com/thirdkey-solutions/damn/blob/master/proposal.asciidoc. (last visit: 30.4.2018).

[385] Id.

[386] Id.

experts, through collaboration of the parties involved or even another DAO specially set up for mediation. Moreover, parties will be competent to choose whether the decision will be made public or not. However, there is no such alternative dispute resolution mechanism which exists for DAOs and in the absence of national legislations; uncertainty remains in a large extent.

SECTION IV: CONCLUSIONS

Smart contracts have a potential to disrupt the notion of enforcement by introducing an absolute level of self-help: they purportedly offer fully automated contracts, which means that agreements can be performed without the need of any human involvement. Therefore, smart contracts challenge well-known contract law concepts, such as performance and efficient breaches. Moreover, smart contracts also make it possible to automate the conclusion phase of the contract using electronic agents; however, this can be problematic for some jurisdictions.

Smart contracts are still subject to the legal frameworks of the states for three main reasons: first, at least with today's technology, it is impossible to ensure a bug-free smart contract code design, which means that human involvement -and especially state enforcement- is always necessary as a substitute way. Second, smart contracts are intended to be effective in the physical world; for example, even if both parties were to agree on to transfer an ownership title of an immovable via blockchain, the transfer might legally not be possible due to the formal constraints, depending on the national law. Third, regardless of how technically difficult it is, states may always take coercive measures for supervision and stay involved in the blockchain systems. As a result, there is little doubt that the intersection of code and law will arise new sets of disputes. The pseudonymous nature of the blockchain raises concerns about compliance with tax law, competition law, the KYC and AML Rules. The decentralized nature causes confusion on the governing law and jurisdiction issues, and brings up the issue of compliance with the criminal law and security law disclosure requirements.

As a self-help mechanism, smart contracts share a common philosophy with ADR. As international commercial arbitration considered the new *lex mercatoria*, some scholars contend that the blockchain breakthrough will create a new legal branch called *lex cryptographia*. Meanwhile, digitalization also paves the way for ODR to increase its share of the cake at the disadvantage of the offline resolution mechanisms. At this point, blockchain may handle an essential function to solve enforcement problems. Especially, the enforcement of cross-border consumer disputes can be problematic due to the fact that it is regarded outside of the New York Convention's application area. The underlying cause to this is that the EU Directives place strict restrictions on the ability of consumers to waive their right to recourse to the court. This is also an issue for domestic arbitration, since some national

legislations regulate that domestic consumer disputes are non-arbitrable. Moreover, given the fact that public enforcement is not feasible in terms of efficiency and time, an internal self-help mechanism is a necessity.

The smart contract based dispute resolution is a kind of private enforcement mechanism. Notwithstanding that private self-enforcement cannot entirely replace public manual enforcement, the co-existence of both mechanisms are beneficial for both the states and the people. For the people, the public enforcement threat will remain like a sword of Damocles hanging over their head, which creates a bargaining zone for settlement for contractual disputes. On the other hand, self-enforcement tools are also useful in terms of public enforcement and criminal law; because otherwise, states are only able to focus on priority offences, cannot ensure equal treatment to everyone, and the whole process of encompassing surveillance to punishment is costly. Accordingly, some states are also working on projects to utilize technology in order to make its judicial system more effective.

Smart contracts are not the oldest private enforcement alternative, but they are the most comprehensive and challenging one. It is important to distinguish private enforcement mechanisms from the ancillary "soft" instruments; such as user reviews, trustmarks and chargebacks. Indeed, soft instruments are aiming to increase the reliability of the system and to build trust among participants; however, these instruments provide limited means to enforce decisions and do not provide a "*one-stop shop*" for the parties as how private enforcement mechanisms do. In that sense, we have discussed two prominent ODR mechanisms; the eBay Dispute Resolution Center and the ICANN, which both emerged as autonomous non-state legal systems imitating structures of state litigation. At section II, we reached to the conclusion that both these models have some severe drawbacks which smart contracts can solve.

Blockchain-based dispute resolution can be regarded as an entirely new and autonomous dispute resolution mechanism. In order to shed a light on this new model, we examined it comparatively with two other direct self-enforcement mechanisms addressed by the UNCITRAL: the escrow based model and the chargeback based model.

The arbitrator in the blockchain-based model is not equivalent to the traditional escrow and agent, and despite the fact that smart contracts may imitate the escrow-like mechanisms,

they do not constitute the traditional escrow. The multi-sig mechanism not only reduces the risk of theft and fraud, but also eliminates the need for two transactions, which is required in the traditional escrow regardless of whether a dispute arises or not. As a result, the traditional escrow causes proportionally high transaction costs for low value transactions and consequently, it would not be wrong to say that the blockchain based model is more useful than the escrow based model.

When it comes to the chargeback model, the blockchain solutions might be a good alternative as well; the risk of a friendly fraud for merchants can be significantly eliminated, especially pertaining to the non-delivery claims. Consequently, the merchants' credit score will be more stable and decisions regarding to disputes will not threaten the merchants' commercial life. On the other hand, the blockchain-based model may protect the buyers' interests better than chargebacks. While a buyer cannot claim for its excessive damages by filing a chargeback request, in the blockchain adjudication, the buyer would be able to claim for excessive damages if the merchant has the sufficient amount of funds to cover the damages in its wallet. As for the aforementioned reasons, if the cost of the blockchain-based model reduces in the long run, it can be a good alternative to the chargeback model and will replace chargebacks to a large extent.

Similar to online contracts, a smart contract is a new method of contract formation; rather than being a new kind of contract. Therefore, the existing contract law rules and principles are still applicable to construe smart contracts' legal status. At this point, it is important to remind that the legality of smart contracts depend on various factors; the smart contracts model and the governing law being in the first place. However, even though a smart contract is not considered as a legally binding agreement, this does not mean that it has no legal meaning at all. As a result, a case-by-case evaluation is always needed to draw an accurate conclusion.

Under the general contract law doctrine, pursuant to the technological neutrality principle, there is no explicit prohibition on expressing contractual terms via data. Despite differing with the traditional offer-acceptance mechanism, the smart contract formation will not constitute a problem for most jurisdictions. The most crucial notion, pertaining to offer and acceptance, is the manifestation of the assents. To prevent the legal uncertainty and make it possible to be able to sue for the remedies in a worst case scenario, it is advisable for the

parties to create a paper contract (which is called “wrapper”). This can be done by the contracting parties, by accepting natural language terms which confer bindingness to the executable code’s future transactions.

Consideration is a necessary component of a legally binding contract, mostly in common law countries; albeit, since reciprocity is the main focus, -consideration- is not a difficult condition to fulfill. However, this is not the case with legal capacity: in case of “follow-on” smart contracts, the connection between the agreement and the human is substantially diminished. Moreover, follow-on smart contracts may not be recognized legally valid in some jurisdictions, according to regulations on electronic agents.

Remedies are still important for smart contracts. No one can ensure that the contract terms would not contain any bugs nor the results will be in direction of the parties’ expectations. Additionally, for some types of smart contracts, a breach may be possible. However, new solutions such as “hard-forking”, are not contract law remedies and it is still unclear as to who is accountable and to in what extent. Consequently, our inference is that new regulations might be useful in that sense, and currently, adopting the blockchain-based dispute resolution may be a good way to decrease uncertainty. In this manner, standardization is also conceivable. Standardization is important as contract codes contain new risks in comparison to paper contracts. Hence, it is vital to test some standards and develop the best practices, in time. However, there is no urgency for a globally unified solution for smart contracts; since the contract law provides party autonomy and accordingly, parties’ can choose the legal system with rules which fits best to their beneficiary for their contract.

In the context of international commercial arbitration, the CISG and the PICC are two of the most important legal instruments, which can be incorporated in governing law clauses in smart contracts. In a liberal interpretation, the CISG will be applicable for contracts based on buying goods with cryptocurrencies. In sum, both instruments provide a favorable legal framework for the formation of smart contracts.

We have chosen USA as our common law example. Ultimately, notwithstanding that the U.S. courts seem to be open for giving legal recognition for automated contracting -including follow-on agreements-, this openness is limited to appropriate circumstances. Currently there are no standards developed relating to manifestation of assents, and it is

highly possible for the courts to develop new standards as this was the case for the click-wrap and shrink-wrap agreements.

France was our civil law example. Ultimately, smart contracts are not *per se* illegal pursuant to the French Law. There are both permitting and restricting factors. The subjective contract law theory constitutes a serious concern with using electronic agents for follow-on smart contracts. However, the French Government has been embracing a pro-active approach in respect to blockchain regulation, and enacting bills in order to enable contracting via a distributed ledger in discrete application.

Itself being a legal phenomenon, smart contracts can also underpin various types of applications which are subject to the different legal rules. Decentralized Autonomous Organizations (DAOs) are one of the important smart contract applications, since we have already encountered with them in practice. This is an entirely new concept and there are various legal concerns which needs to be addressed. Due to the legal uncertainty and practical reasons, an internal dispute resolution mechanism is also needed in order to resolve possible disputes.

Under corporate law, DAOs will probably be considered as a kind of general partnership, joint venture (especially for the tax purposes) or unincorporated association. Thus, internal rules governing a DAO's conduct between its internal members, will be hardly useful when interacting with an external jurisdiction. Courts may opt to identify the legal representative on the basis of marketing efforts.

In order to determine the jurisdiction to sue a DAO, a geographical approach will not be suitable, in most cases. Hence, the most accurate criterion to determine the jurisdiction is grounding on the DAO's creator (congress leader) and the service company. The underlying reason to this is that there is little doubt that the regular transactions of a DAO is attributed to its incorporated service company; truthfully, depending on the context and the cause of action.

The DAO attack showed that the law is unprepared for DAOs. Consequently, providing a specific legal personality and status for DAOs, and regulating new remedies such as hard-forking, may be helpful. In this respect, the stakeholders of a DAO can develop special online dispute resolution systems, before the states. With this solution, the

stakeholders can escape from jurisdictional ambiguity, find a room to implement their internal rules in a wider extent, and enforce decisions more easily.

Despite all aforementioned explanations and suggestions, we are aware that infrastructure costs are excessively high and volatile for low-end disputes under current developments in technology and the lack of standardized codes. When it comes to high value disputes, the complexity of these disputes and the parties' desire of a physical medium can be seen as an obstacle. Hence, there is still quite a while for the widespread use of the blockchain-based automated online dispute resolution. However, proliferation of e-commerce also followed a similar path: after the advent of the World Wide Web, e-commerce took 20 years to hold on and another two decades to maturity. Therefore, when we bear in mind that some technical solutions are already being developed, and some states with high trade volumes follow pro-active approach in terms of regulation, it would not be an irrational prediction to anticipate that by the end of the 2020's, smart contracts and the blockchain-based dispute resolution will be used at scale and will facilitate enforcement via automation. Nevertheless, as it was stated as hypothesis, our study shows that existing legal frameworks are not ready to underpin the complete application of smart contracts. Thus, regulators should embrace a pro-active approach and work with various people groups including technologists, businessman, scholars, lawyers and judges, within this period. Otherwise, it would not be easy for smart contracts to reach its maturity or become an enforcement alternative for dispute resolution.

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