ANTONIO DAVOLA – ROBERTO PARDOLESI

WHAT IS WRONG IN THE DEBATE ABOUT SMART CONTRACTS

I- The future is upon us…isn't it?

Around two dozen years ago a computer scientist named Nicholas J. Szabo, in an attempt to canvass the legal implications of his techno-approach, coined the – unexpectedly successful– label "Smart Contracts", which is nowadays adopted to address a vast range of 'supercontracts' that, like mighty superheroes, are supposed to handle any task by themselves.

Truth to be told, Szabo's proposal was more discrete than what the subsequent debate would suggest: he defined smart contracts as "a set of promises, specified in digital form, including protocols within which the parties perform on these promises",[1] offering a preliminary overview of their potential applications.[2] Consistently with this view, his initial overview assumed as paradigmatic reference the typical "vending machine" – automatically providing goods and services after receiving an adequate payment. Despite this somewhat humble *incipit*, the debate over smart contracts rapidly moved towards more ambitious frontiers: from being mere dispensers of services, smart contracts evolved firstly into isomorphic security protocols, designed to ensure compliance with the terms of an agreement, and then even further into multilateral, "fraud-proof ", protocols.[3] The ultimate step of this Darwinian-like path is the – widely diffused – current belief that smart contracts are tools capable to subsume any aspect of an agreement within the technological realm, consistently with (a misguided reading of) Lessig's lesson stating that, nowadays, "code is law"[4]. This perspective is the result of a mixture of (small) concrete developments and (several) utopistic hypotheses; yet it led legal scholars to evaluate the possibility to create "contractware", feeding informatic devices with the terms and clauses of the agreement and ultimately allowing a code to operate as a gatekeeper for the contract, being able to guarantee *ex ante* the fulfilment of the obligations necessary for its diligent execution.[5]

The theoretical framework has been further alimented by the subsequent technological advancements and, in particular, by the entrenched belief that artificial intelligence will, sooner or later, replace any human activity. Starting from its earliest applications in the game of chess, where the number of combinations was finite (though monstrously elevated), A.I. is nowadays seen as fit to operate also in those fields where interactions are not predetermined, encompassing systemic uncertainties that can be solved only through decisional synthesis.[6] The debate over silicon-based contracts is further stimulated by the developments of

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[1] *Smart Contracts: Building Blocks for Digital Markets*, https://perma.cc/YC35-2MXQ, 1996.

[2] Originally, smart contracts' application was supposed to be limited to "POS terminals and cards, EDI, and agoric allocation of public network bandwidth" in order to reduce individual deviations dictated by selfishness or antagonistic interests, and to guarantee the reliability of intermediaries involved in transactions. See http://www.fon.hum.uva.nl/,rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart.contracts.html.

[3] Even if, currently, violations of electronic agreements – especially the ones involving cryptocurrencies – are still present and frequent. See e.g. U.S. RODRIGUES , *Law and the Blockchain*, 104 Iowa L. Rev. 679, 695 ff. (2018).

[4] R.H. WEBER , "*Rose is a rose is a rose is a rose"- what about code and law?,* in *Computer L. & Security Rev.*, 2018, 701

[5] M. RASKIN , *The Law and Legality of Smart Contracts* , 1 Geo. L. Tech. Rev . 305 (2017).

[6] G. GITTI, *Robotic Transactional Decisions,* in Osservatorio dir. civ. e comm., 2018, 619, 621: "[I]f it is easy for the robot to associate a decision output to a given event (if A occurs then I will choose X), no matter how complex to detect, this does not detract from the fact that if A is ontologically unpredictable the machine will not be able to add much…".

cryptographic technologies: the diffusion of the (much fabled) blockchain,[7] operating as a perfect register through its decentralized ledgers, and the crescent attention towards its application as a platform for the circulation of information and goods (such as bitcoins), attracted scholars' growing interest, intellectual efforts and monetary speculations: blockchain intertwined with the very own definition of smart contracts, and currently –as will be seen in a while- the vast majority of legal contributions in the field cannot discuss one of the two notions, without addressing the other one as well. Whether this tendency is correct or not is an aspect that we will address in the course of this work. As of now, another aspect must be added to the scene: legal scholars – acting as sort of newly-formed engineers – put another layer of complexity on the field, and questioned the very characteristics and meaning of the notion of contract, its underlying principles and legal regime. Enthusiasts of technologies began to wonder whether the rise of smart contracts was an undisputable symptom of the death of the traditional one, arguing in favor of a complete and needed revolution of the role and functions of the legal professions.[8]

Before going more in depth of these considerations, we want to reassure our readers: in this work, it is not our intention to indulge in futuristic speculations; furthermore, you will not find in this article any umpteenth explanation of how the blockchain– and its block system – works, can foster reliability, transparency, stability, self-enforcement etc., both within and outside the legal realm. Our (modest) goal is to highlight the significant amount of contradictions characterizing the current debate over smart contracts (probably not so smart and not even able to express a contract identity). Then, some critical remarks on their aptitude to revolutionize traditional contract law will follow, in order to evaluate whether the legal implications of these changes are (at least) as relevant as the technological ones.

II- The everlasting pursuit of contract 2.0

Before we get to illustrate the reasons behind our skepticism toward the (alleged) disruptive effects of smart contracts for the legal framework, it is opportune to offer a (hopefully concise) overview of the relevant literature. This is necessary, as a matter of fact, to provide a solid basis for our considerations, and to contextualize our reflections within the current state of the art of the legal debate.

In conducting this activity, some preliminary *caveat* are to be taken into account: the amount of contribution addressing the topic – especially when interdisciplinary works are considered – is vast and heterogeneous. As a consequence, we restricted the scope of our analysis to contributions targeting the specific problem of smart contracts from the perspective of law and regulation. And yet, even after engaging into a thoughtfully selective process, excluding (on one hand) works by technicians generically dealing with regulatory topics and (on the other one) contributions by legal scholars misinterpreting the inner characteristics of the technology, the task proved itself arduous. Note that this is another significant proof of how difficult it is to develop a true interdisciplinary approach to the topic, suggesting – once again – caution for those who want to engage in the area of Law&Technology.

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[7] For a comprehensive overview of the topic, and its legal applications, see (forthcoming) P. HACKER, I. LIANOS, G. DIMITROPOULOS and E EICH, *Regulating Blockchain: Techno-Social and Legal Challanges,* Oxford University Press, www.ssrn.com, November 2018.

[8] Cfr. R. SUSSKIND and D. SUSSKIND, *The Future of the Professions: How Technology will Transform the Work of Human Experts,* Oxford University Press, 2015; G. FINOCCHIARO, *Il contratto nell'era dell'intelligenza artificiale,* in Riv. trim. dir. e proc. civ., 2018, 441. See also M.FENWICK, W.A. KAAL and P.M. VERMEULEN, *Legal Education in a Digital Age. Why 'Coding for Lawyers' Matters,* www.ssrn.com, 2018, moderately explaining that "an understanding of code and coding [is] essential to participate effectively in our digital world", in order to teach law students "how to code and inspiring them to get out of their comfort zone, will be a necessary first step to help them embrace the many future opportunities of a software-based environment".

The manifold framework of contributions in the field unveils the presence of purely theoretical speculations, next to works actually engaging with (when not approximately evoking) the legal practice. A common feature that many of these researches share is the goal of providing a definition of smart contracts.[9] The goal is often met through extensive – when not exhausting – overviews of all the technicalities surrounding the blockchain and its derivative structures (*in primis* the cryptocurrencies and the Ethereum platform).[10] Then, authors usually provide considerations on the (casual or structural) relation between the abovementioned elements and smart contracts, intended as allegedly legal phenomena.[11]

Regarding this last aspect, part of the literature generally qualifies smart contracts as automatized systems (bot contracts?) for the execution of contractual agreements: such a definition is sufficiently vague to encompass both high-frequency financial transactions[12] or (potentially collusive?) interactions amongst algorithms implemented in the setting of prices to reach profit maximization.[13] In any case, no human interaction is ever present, and the whole activity is conducted by the smart code on its own. According to this wide notion, segmented fragments of an agreement can be considered smart contracts as well: even when no contractual intention is present, they are nevertheless instrumental to the realization of transactional operations that might – depending on the concrete case considered – be qualified as juridical acts.[14] As a drawback for embracing such a vast categorization, the outlines of a smart contract's essence are forcefully blurred and often out of our focus: while some contributions still cling to the proto-industrial prototype of the vending machine (which is not particularly challenging from a legal perspective), others evoke sophisticated, computerized procedure that nevertheless lack the economic architecture representing the *ubi consistam* of private autonomy.

In this fragmented reality, a brand-new movement seems to emerge: being increasingly identified with codex operating in the blockchain, smart contracts are currently supposed to regulate the economic operations that take place on this platform and to automatically execute all the transactions mandated by their directives. Through this *escamotage*, the relation between the two technologies is inverted, and the blockchain is set to become the minimum common denominator for any smart contract, which is expected to ontologically operate within the blockchain.[15] This overlap affects the regulatory interventions proposed by

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[9] C.D. CLACK, V.A. BAKSHI and L. BRAINE, *Smart Contract Templates: Foundations, Design Landscape and Research Directions*, Cornell University Computing Research Repository, http://arxiv.org/pdf/1608.00771v2.pdf, 2016.

[10] M. KÔLVART, M. POOLA and A. RULL, *Smart Contracts*, in T. KERIKMÄE e A. RULL (eds.), *The Future of Law and eTechnologies*, Springer, 2016, 133.

[11] See, *ex multis*, E. MIK, *Smart Contracts: Terminology, Technical Limitations and Real World Complexity*, 9 Law, Innovation & Technology 269 (2017). The author explains that originally "smart contracts were contemplated within a limited range of transactions, predominantly financial instruments", whereas nowadays "all contracts can be made smart", with a major impact on the legal landscape as a whole: "allegedly, smart contracts can streamline the contracting process, reduce transaction costs by eliminating intermediaries and, most importantly, simplify enforcement by obviating the need to seek protection from traditional legal institutions, such as courts"

[12] See F. DI CIOMMO, *Gli Smart Contract e lo smarrimento del giurista nel mondo che cambia. Il caso dell'High Frequency Trading (HFT) finanziario,* in corso di pubblicazione, F. FIMMANÒ - G. FALCONE (eds.), *Fintech*, (Collana Regole e mercati, Universitas Mercatorum, Napoli), forthcoming 2019.

[13] T. SCHREPEL, *Collusion by Blockchain and Smart Contracts,* www.ssrn.com, 2019.

[14] S.D. LEVI e A. B. LIPTON, *An Introduction to Smart Contracts and Their Potential and Inherent Limitations,* https://corpgov.law.harvard.edu, 2018, observe that the actual tasks that smart contracts currently execute are, in the very end, "fairly rudimentary", being these tools limited to operate as "vehicles to effectuate certain provisions of a traditional text-based contract" (therefore operating as "ancillary smart contacts"). According to the authors, we are "many years away from code being able to determine more subjective legal criteria".

[15] MIK, cit.: "purportedly, smart contracts are contracts that are represented in code and executed by computers. They are not only formed online but their very performance in enabled and *guaranteed* by a network of

scholars on the issue.[16] The inevitable outcome is that any contract can get "smart", as long as its information transmigrate into the blocks.[17]

Such a position unveils, however, the major shortcomings of this narrative, and the fragility of its foundations: the legitimacy of the whole smart contract framework is based on the idea that the blockchain will radically redefine and pervade any aspect of individual relationship, originating the true "contract law 2.0".[18]

All these conjectures are, on the contrary, and against this bedrock, doomed to fail if blockchain will reveal itself – as many are hypothesizing[19] - as the proverbial solution in search for problems: in spite of the huge enthusiasm accompanying the developments of this technology in its early days, blockchain still struggles to find far-reaching applications. If its contribution to the improvement of commercial transactions should turn out to be marginal, its role as a means to revolutionize contract law should be questioned as well.

As a consequence of the current technical and economic uncertainty of the phenomenon, the debate about its legal implication is equally precarious, and defending the idea of upcoming diffusion of these technologies require some sort of a leap of faith. On one side, "true believers" of smart contracts and blockchain magnify these tools, their potentials, and capacity to bring the automation of contract to its limits;[20] they promote the use of technologies that can – allegedly – predict a huge amount of variables to provide highly sophisticated solutions.[21] On the other side, there are scholars unwilling to endorse this technologic miracle: they display doubts on the capacity of smart contracts to encircle all the different facets that characterize traditional contracts – and their bargaining process – suggesting a more cautious approach.[22]

The framework appears equally heterogeneous when the implications of smart contracts for social developments are considered. With regard to this aspect, many contributions stress the macroscopic issues that the widespread deployment of smart contracts might raise in terms of *governance* and control by public entities[23] and their impact on the democratic structures of power.[24] In particular, the idea that smart contracts constitute a form of private regulation, operating side by side – independently from, and in parallel with – the traditional public one,

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decentralized, co-operative computer nodes, known as blockchains". See also L. PAROLA, P. MERATI and G. GAVOTTI, *Blockchain e smart contract: questioni giuridiche aperte,* in Contratti, 2018, 681, 683.

[16] *Arizona Revised Statutes*, § 44-7061, lett. E 2, 2017: "Smart contract means 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); Tennessee Code Annotated, § 47-10-201 (2), 2018. For that matter, consider also Article 8-*ter* of (Italian) Law No. 12 of 12 February 2019.

[17] On the idea that "contracting has always been about the fine print" and that "code can capture the fine print" see J. S. GANS, *The fine print in smart contracts,* www.nber.org/papers/w25443, 2019.

[18] A. SAVELYEV, *Contract law 2.0: 'Smart' contracts as the beginning of the end of classic contract law,* 36 Information & Communication Technology Law 116 (2017).

[19] M. HIGGINSONM, M.-C. NADEAU e K. RAIGOPAL, *Blockchain's Occam Problem,* https://www.mckinsey.com/industries/financial-services/our-insights, 2019.

[20] H. SURDEN, *Computable Contracts*, 46 U.C. Davis L. Rev 629 (2012).

[21] See V. BUTERIN e al., *A Next Generation Smart Contract and Decentralized Application Platform,* White Paper on GitHub.

[22] J. A. DRUCK, *Smart Contracts Are Neither Smart Nor Contract,* 37/10 Banking & Financial Services Policy Report 5 (2018); K.E.C. LEVY, *Book-Smart, "Not Street-Smart: Blockchain-Based Smart Contracts and The Social Workings of Law*, 3 Engaging Science, Technology, and Society 1 (2017); THE ECONOMIST, *Not-so-clever contracts*, www.economist.com/news/business/21702758-time-beiconomist,ng-least-human-judgment-still-better-bet-cold-hearted, 28 Jul. 2016.

[23] A. WRIGHT, P. DE FILIPPI, *Decentralized Blockchain Technology and the Rise of Lex Cryptographia*, https://ssrn.com/abstract=2580664, 2015

[24] W. REIJERS, F. O'BROLCHÁIN, P. HAYNES, *Governance in Blockchain Technologies & Social Contract Theories*, *Ledger,* Vol. 1, 2016; B. SCOTT, *Visions of a Techno-Leviathan: The Politics of the Bitcoin Blockchain*", http://www.e-ir.info/2014/06/01; R. O'DWYER, *The Revolution will (not) be Decentralized: Blockchain*", http://commonstransition.org/the-revolution-will-not-be-decentralised-blockchains/, 2015.

forestalls the rise of new mechanisms for the resolution of disputes, subtracted from the traditional jurisdiction of public law.[25]

Despite the presence of a significant strand of research investigating the impact of smart contracts in terms of public-private powers interaction, the vast majority of scholarly contribution on the topic is certainly focused on the impact of this technology on private relations, analyzing its opportunities and risks. Here, the definitional problem (finding an identity, if there is one) arises once again: it is, in particular, necessary to decide whether a smart contract can be qualified as a true agreement, symptomatic of private autonomy, or if (on the contrary) the notion is nothing but a "fancy name" to identify those - already existing - codices that interact with blockchain platforms.[26]

The debate therefore moves to the problem of the characterization of "smart contracts" as proper contracts according to private law[27] or, rather, as innovative protocols to transfer data.[28] If the second alternative is accepted, then the impact of smart contracts on the juridical reality is drastically diminished: the expectation that smart contracts may radically redefine the dynamics of digital exchanges,[29] limiting parties' autonomy in the execution of their obligations[30] and ultimately nullifying any contractual risk,[31] is confuted at its very own roots. The same fate goes for all claims regarding the capacity of such contracts to overcome the vast majority of problems characterizing "human" negotiations[32] and to promote a high-level of protection for "weak" agents in the market, and *in primis* for consumers, who, according to "technological evangelists"[33], might be adequately empowered – by these emerging opportunities – to finally counteract the information asymmetry that constitute the traditional source of disparity in B2C contracts.[34] In addition to that, opponents claim that, since smart contracts are incapable of effectively displaying individual preferences, an unintended effect of their consistent adoption would be depriving regulators of significant pieces of information on consumers' priorities and *modus operandi*. Also, further concerns invest the potentially discretionary evaluations that algorithms can operate,[35] and their adequacy to conform to social values such as transparency and substantive justice.[36]. Whether the take-off of smart contracts would overall lead to an effective increase of consumer protection within the legal system is not that easy to assess.[37]

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[25] M. DUROVIC, *Law and Autonomous Systems Series: How to Resolve Smart Contract Disputes - Smart Arbitration as a Solution,* Oxford Business Law Blog, https://www.law.ox.ac.uk, 2018; A. HACKE, *Law and Autonomous Systems Series: Micro-Justice and New Law? "Swarm Arbitration" as a Means of Dispute Resolution in Blockchain-Based Smart Contracts*, *ibid.* 2018.

[26] G. GREENSPAN, *Beware of the Impossible Smart Contrac*", https://www.the-blockchain.com, 2016.

[27] See T. ALLEN, R. WIDDISON, *Can Computers Make Contracts?*, 9 *Harv. J. L. and Technology* 25 (1996); SURDEN, cit., 629; and K. WERBACH and N. CORNELL, *Contracts Ex Machina*, 2017 Duke L. J. 338.

[28] J. STARK, *Making Sense of Blockchain Smart Contracts,* http://www.coindesk.com/making-sense-smart-contracts, 2016.

[29] See P. CUCCURU, *Blockchain ed automazione contrattuale. Riflessioni sugli smart contract*, in Nuova giur. civ., 2017, 1, 107.

[30] T. SWANSON, *Great Chain Of Numbers: A Guide To Smart Contracts, Smart Property And Trustless Asset Management*, 2014, 14

[31] V. PASQUINO, *Smart Contracts: caratteristiche, vantaggi e problematiche*, in Diritto e processo, 2017, 11; D. DI SABATO, "*Gli* smart contracts robot *che gestiscono il rischio contrattuale*", in Contratto e impr., 2017, 328.

[32] R. HOLDEN e A. MALANI, *Can Blockchain Solve the Holdup Problem in Contracts?,* University of Chicago Coase-Sandor Institute for Law & Economics Research Paper No. 846, 2017, https://ssrn.com/abstract=3093879, 2018.

[33] D.H. HOFFMAN, *Relational Contracts of Adhesion,* 85 U. Chi. L. Rev. 1396, 1460 (2018).

[34] J. FAIRFIELD, *Smart Contracts, Bitcoin Bots, and Consumer Protection*, 71 Washington and Lee L. Rev. Online, 2, 2014, 35, http://scholarlycommons.law.wlu.edu/cgi/viewcontent.cgi?article=1003&context=wlulronline.

[35] T. GILLESPIE, *Can an Algorithm Be Wrong?, LIMN,* 2, http://limn.it/can-an-algorithm-be-wrong, 2012.

[36] L. SCHOLZ, *Algorithmic Contracts*, 20 Stan. Technology L. Rev. 128 (2017).

[37] K.E. DAVIS, *Contracts As Technology*, 88 *N.Y.U. L. Rev.* 83 (2013).

To tell the truth, no aspect of this debate seems truly original to us: many of these topics have already been discussed within disputes over the impact of automated decision making technologies on the law.
On the opposite, if the "contractual path" is embraced, then the compatibility of smart contracts with the provisions of contract law is immediately relevant.[38] The issue can be addressed from different points of view, including – but not limited to – the way interpretation rules are supposed to operate for smart contracts; [39] how the adequacy of consent is proven when the agreement is concluded (especially if the contract operates as a long-term one); [40] how liability should be allocated in case of malfunctioning of the smart contract, [41] and which level of burden of proof should be required from claimants and defendants in order to succeed in court. [42]
All these topics, nonetheless, deserve attention only if we believe that a smart contract is, at the very end, a (type of) contract: if, on the contrary, they represent mere tools susceptible to be encompassed within the (traditional) contractual practice – as part of legal scholarship defends[43] –, then all these questions are devoid of their primary foundations.

III.- On Virtues and Vices of Innovation

Against the fragmentation of the existing debate – as a result of the disordered overlap and intertwining of heterogeneous contributions – some clarification is therefore opportune. In our view, two profiles should be further investigated: firstly, how the relation between blockchain (i.e. the cryptographic technology) and smart contracts (in its phenomenological meaning) should be assessed. Secondly, smart contracts' very own nature should be analyzed, in order to ascertain whether to qualify them as (sort of) digitalized contracts.

III. 1.- Considering the first aspect, we hold true that the mantra of a stringent relation between blockchain and smart contract should be dissipated, in the sense that the latter are not ontologically dependent from the existence of blockchain-like technologies. This position derives from a series of persuasive considerations.
Firstly, the use of binary codes to incorporate and computerize parts of a contract is not a brand-new phenomenon: for example, the usage of electronic format to digitally communicate was already diffused in the product chain before internet and e-commerce got massively exploited through EDI (electronic data interchange) technologies. Then, building on this experience, data-oriented contracts – in which the parties have expressed one or more terms or conditions of their agreement in a manner designed to be processable by a computer system – spread out; and still, the interpretation of the contractual terms and parties' intention has been demanded to the traditional juridical system.[44]
It is indeed true that Szabo's informatic protocols (in their hypothetical functioning) were radically different from the previously existing solutions: they were supposed to circulate on the internet, transposing and digitalizing any aspect of the contractual process, from negotiation to execution. Szabo's digitalized contracts would have operated without any external support, nor human assistance, encompassing any relevant legal aspect: they would have been, truly, supercontracts (if you prefer, bot contracts…).

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[38] FINOCCHIARO, cit.; PAROLA, MERATI, GAVOTTI. *supra* fn. …
[39] A. CASEY, A. NIBLETT, *Self-Driving Laws*, 66 U. Toronto L. J. 429 (2016).
[40] M. CHIERICI, *Gli Smart Contract: profili giuridici con una struttura informatica*, http://www.salvisjuribus.it, 2018.
[41] A.J. KOLBER, *Not-So-Smart Blockchain Contracts and Artificial Responsibility*, 21 Stan. Tech. L. Rev., 2018, 198.
[42] I. CAGGIANO, *Il contratto nel mondo digitale*, in Nuova giur. civ., 2018,1152.
[43] J. M. LIPSHAW, *The Persistence of "Dumb" Contracts,* www.ssrn.com, 2018.
[44] H. SURDEN, *Computable Contracts*, 46 U.C. Davis L. Rev 629 (2012).

Until 2008, though, Szabo's conception was little more than a project. Then, finally, the development of the blockchain and the bitcoin revolution offered his followers an open-ended technology, suitable to be virtually applied to any form of "trusted transactions", including contracts.[45]

Our referring to trust is not extemporaneous: in order to properly operate, traditional contracts must be binding for the parties: hence, the traditional recourse of the parties to external systems of remedies, adjudication, etc. Against such a traditional framework, when a contract is digitalized within a decentralized ledger, it acquires immutability and the correct execution of the contractual obligations is safeguarded. In other terms, "once the computers determine that the requisite state has been achieved, they automatically perform data-oriented or computable contracts … The computers in the blockchain network ensure performance, rather than any appendage of the state. And, because blockchains run on a distributed network of independent nodes, with no central control point, a litigant seeking to enjoin performance of a smart contract has no one to sue" [46].

The chain constituted through electronic blocks represents, therefore, the applicative dimension that Szabo's vision was devoid of. In the wake of the enthusiasm generated by the rise of cryptocurrencies, many scholars believed that a so long desired paradigm-shifter was found.[47] In the blockchain, smart contracts are supposed to be protected from manipulation, to ineluctably execute the obligations they encompass and at the same time avoid all the vagaries that characterize the "forensic lottery": they are, so to say, engineered contracts.

The implementation of smart contracts obviously presents potential drawbacks (e.g., if the contract is truly unmodifiable, how should an error be corrected, or how should a lack of information be filled without any possible legal intervention?);[48] these problems, though, are often overlooked, due to the frenzy generated by the speculation on cryptocurrencies. Ultimately, it is undeniable that the introduction of the blockchain brought once again the debate on smart contracts at the center of the legal and regulatory arena.

Yet, this does not mean that the blockchain is a constitutive element of any smart contract, or the sole means to develop this instrument: if, on one side, blockchain offers the possibility to have self-enforcing contracts including transparent and immutable information, the profound uncertainty surrounding the general applicability of decentralized ledgers should not be overlooked as well. When this aspect is considered, it is intuitive to grasp an inconvenient truth: the automatic execution of contractual obligations – when the conditions set by the parties and written in the code are met – is not ontologically derived from the use of the blockchain: it is, rather, the result of the parties' choice to devote an informatic technology the performance of the (previously concluded) arrangement, after agreeing on its conditions.[49] What truly counts is that the parties trust the reliability of the automatic system, be it the blockchain or another one.

We might, therefore, assume that the blockchain is not the *condition sine qua non* for the functioning of smart contracts, but just one of the possible tools for their implementation; if smart contracts are meant to spread in the legal practice, this might as well happen through technologies, other than the blockchain,[50] that will reveal themselves as more suited to adapt to users' needs.

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[45] M. GIANCASPRO, *Is a 'smart contract' really a smart idea? Insights from a legal perspective,* 33 Computer Law & Security Rev. 825 (2017).

[46] WERBACH and CORNELL, *supra* fn. …, ,332.

[47] SAVELYEV, *supra* fn. …, 121.

[48] RODRIGUES, *Law and the Blockchain*, *supra* fn. …,714 ss

[49] DI CIOMMO, *supra* fn. …

[50] E.g. in 2017 the CodeX- Stanford Center for Legal Informatics launched a White Paper on the s.c. Legal Specification Protocols. See *Developing a Legal Specification Protocol: Technological Considerations and Requirements,* https://.law.stanford.edu, Jan 2019 (p. 27 ss.).

III.2.- If the relation between blockchain and smart contracts can be disentangled with a minor burden, assessing whether smart contracts should be qualified - *ratione materiae* – as proper contracts is a much more difficult task, given the vast heterogeneity of aspects to take into account.
It goes without a doubt that a smart contract does not operate as a traditional one whenever the automated protocol administers specific fragments or parts of a general, wider, agreement: one step in the contractual *iter* – as technological and clamoring might be – does not encompass the whole agreement, being rather just a tassel in a more complicated mosaic. When this perspective is considered, the issue is easily solved.
The problem is, though, harsher if we hypothesize that the code is used to gather and regulate the whole agreement (as the result of the parties' private autonomy) and that the software is able to operate autonomously and to self-sufficiently execute the contract in any respect. In this case, we are inspecting the projection of the contract into a fully computerized process. The plan of the parties is reversed into a program, which is meant to perform all the related procedures without external interventions: the agreement is, in some sense, the trace upon which the code is written, as a crystallization of the parties' 'meeting of the minds' in binary form. This might not be a contract, but it certainly looks like its operative form.
Proceeding even further on this path, we might evaluate the characteristics of those situations, when consent originates since the beginning in code form. As Surden pointed out,[51] no existing provision of contract law prohibits the parties to express their contractual obligations as data-oriented representations (that might as well be included in the blockchain): any economic operator might, for example, structure a code providing that, when (and if) certain conditions are met, some goods are transferred to another individual. Such a phenomenon would not create significant uncertainties for contractual law, but for the fact that, in the example just made, the software is autonomously elaborated by one party, and the counterparty is required to merely provide her approval in order to make the contract binding: through this *escamotage*, the essential moment of the agreements escapes the clutches of computerization.
This consideration has two consequences: on one side, it invites scholars to address the divide between unilateral and bilateral contracts, and its implication within the realm of smart contracts. On the other side – and more importantly – it unveils that the traditional narrative of smart contracts as tools to reduce time and costs of transactions might be superficial, as soon as the creation of a (true) smart contract requires the contribution of a plurality of people. Someone who wants to launch a contractual initiative needs first, and foremost, a software developer[52] to transpose the instructions related to the various aspects of the agreement into the virtual architecture, to build a data model (structured according to directives and conditionals) for the offer to operate, considering also different forms of interaction with the counterparties. Hence, the possibility of radically disintermediating the contract is already confuted at its roots. Consider that, moreover, the developer must also be able to relate with another operator, in charge of establishing the conditions for the access to the platform where the code will operate (and where the general public, or the counterparty, will be able to find and eventually conclude it). Lastly, users acting on the platform must be able to interact with the "proposal" if they wish to amend its conditions before concluding the

[51] WERBACH e CORNELL, *supra* fn. …, 342 ff.
[52] Note that this entails significant issues in terms of trust as well. See A. WALCH, *In Code(rs) We Trust: Software Developers as Fiduciaries in Public Blockchains,* www.ssrn.com, 2018.

contract, as it traditionally happens during negotiations: this requires the presence of other intermediaries on their side too.[53]
This means first and foremost that we are facing a multi-level process, entailing (at the very least) significant costs for the parties. In order for these costs to be justified, economies of scale are therefore pivotal: as a consequence, it is reasonable to expect that smart contracts might diffuse primarily in "take it or leave it" scenarios where costs are lower, such as in the case of standard forms.[54]
Apart from mass transactions, these tools might find space in 'framework' contracts as well, where the general obligations of a social group are collectively regulated (with a minor degree of detail): in this field, smart contracts would eventually typify mass models operating as common templates[55] (and maybe as decentralized applications). In these contexts, given that the software is able to automatize the procedures for the execution of the obligation, major attention could be devoted to developing (standardized) technologies able to elaborate and entrust those same obligations to the software.
The obvious consequence is that traditional, individual contracts shy away from this logic: the presence of heterogeneous needs of the parties, looking for the (often unique) equilibrium of their (possibly conflicting) social, economic and geographical constraints, is difficult to conciliate with the exigency of standardization that would make smart contracts economically viable.
The existence of a proper category of smart contracts, as prospected in its most enthusiastic fashion by scholars, reveals then itself as a fascinating exercise of imagination: everything that is (even vaguely) related to code, bit, and contract, is forcefully conducted within the related debate. We believe, though, that this vast amount of human capital (could, and) should embrace a different and more robust perspective.

IV.- Looking forward: with caution…

Now, the ultimate question arises: should we conclude that the literature on smart contracts is hopelessly misguided, or can we just try to re-frame the problem, in order for our approach to the topic to evolve?
The critical evaluations we operated on the traditional approach to the legal analysis of smart contracts do not aim at marking what has been written until now as inadequate or detached from reality. Our goal is, rather, to provide some observations in order to bring the debate within the scope of a rigorous methodology. This, to avoid that the excitement over a topic – that is undoubtedly fascinating – ends up undermining the fundaments of a trustworth analysis, which is always required from legal scholars.
In our view, two basic conceptual misinterpretations currently affect the debate on smart contracts (and similar technologies).
Firstly, we believe that it is fundamental to radically distinguish the analysis of technologic advance from the investigation on the renewal of the contractual framework. As we already underlined, the rise of "supercontracts" - able to autonomously (and automatically) handle all the heterogeneous aspects characterizing contract practice amongst individuals - is unlikely

[53] A thoughtful investigation of this topic has been offered by S. COHNEY, D. HOFFMA, J. SKLAROFF e D. WISHNICK, *Coin-Operated Capitalism*, www.ssrn.com, 2018, who investigated a series of 50 2017 'Initial Coin Offerings', ICOs, conducted on smart contracts. Despite the offering claim that "code does have the potential to become a substitute and complement for old-fashioned legal governance in financial contracting", the Authors ultimately observed that "potential does not mean reality. Our study shows just how far code falls short of expectations".
[54] P. D. FILIPPI and A. WRIGHT, *Blockchain and the Law: The Rule of Code,* Harvard University Press, 2018, discuss about "mass-produced smart contracts". Also, FENWICK, KAAL and VERMEULEN *supra* fn. …, 22 f.: "an often-cited example is the 'purchase' of music through Apple's iTunes platform. A computer code ensures that the 'purchaser' can only listen to the music file on a limited number of Apple device".
[55] K. B. CORNELIUS, *Smart contracts and the Freedom of Contract Doctrine*, 5 J. Internet L. 3 (2018).

to happen (at least) in the short term. As a consequence, it is trivial to indulge into disruptive reinterpretations of contracts law: it is first and foremost necessary to comprehend the true nature of the technology at stake and then, eventually, to evaluate the opportunity of a shift in the traditional interpretative paradigms of contract law, knowing that this change must be based on the actual developments of these innovations.

As a corollary, it is opportune to overcome the epidermic belief, according to which any technologic innovation shall be followed by a legal change. Despite emerging technologies' capacity to promote radical changes in the society, legal operators should always keep in mind that these innovations require a modification of the *ius quo utimur* only if they create original forms of interactions, (potentially legal) relationships amongst individuals, and ultimately new risks within the society, that cannot be addressed through the *ius conditum*. Of course, it is equally possible for a technology to qualitatively innovate an existing phenomenon by exposing the shortcomings of the previously existing regulation, and its supervened inadequacy to pursue those values that it is (and it was since its origin) meant to protect. Yet, in order for this to happen, such a technology must, at least, attain a significant degree of relevance (both in diffusion and utilization) in the society: in the case of smart contracts, it seems that this scenario is still distant.

The second conceptual misinterpretation we want to address concerns the constant overlap between policy and legal interventions in the debate over smart contracts. If it is true that legal analysis can be (as it often happens in the debate amongst American scholars) aimed at the provision of policy indications, it is equally proper to acknowledge that some problems introduced by emerging technologies require evaluations of *lato sensu* political opportunity (e.g. the choice regarding the degree of reliability that a technology deserves): in these cases, the legal analysis should follow – and not anticipate – the political choice.

Considering these (still unsolved) issues, a viable solution for legal scholars could be "giving up" on qualifying smart contracts as a general topic, and to rather focus their investigations on the specific effects that the implementation of an innovation (e.g. blockchain) has on the contractual practice. In doing so, though, contract law should be declined according to its traditional canons and categories, and these technologies should be seen for what they currently are, i.e. segments of pre-existing relational models: they can definitely enhance contractual structures in terms of efficiency but are yet unable to modify their ontological characteristics.

Once clarified that there is a substantial difference between technologic innovation and modification of the regulatory framework, it might therefore be preferable – for those who seriously want to engage in Law&Technology – to focus on the implications of each specific phenomenon (*in primis*, cryptocurrencies) for the legal system. In doing so, the temptation of a generalist approach should always be avoided: the constant stretch towards "disruptive" topics cannot endanger the critical and methodological rigor that must animate legal research. There will be plenty of time to establish a solid debate on smart contracts in the future, when the time (truly) comes; as of now, there is probably no need to hurry and fall into inaccuracy.