The Possibility of a Uniform Legal Language at the Interplay of Legal Discourse, Semiotics and Blockchain Networks

Pierangelo Blandino[1]

Abstract

This paper explores the possibility of a standard legal language (e.g. English) for a principled evolution of law in line with technological development. In doing so, reference is made to blockchain networks and smart contracts to emphasise the discontinuity with the liberal legal tradition when it comes to decentralisation and binary code language. Methodologically, the argument is built on the underlying relation between law, semiotics and new forms of media adding to natural language; namely: code and symbols. In what follows, I will concentrate on the study of factors that explain why such approach can be fruitful for the future of law and innovation. I have three reasons for selecting this topic. The first is a more pragmatic reason, based on my current research of law as a linguistic phenomenon. Secondly, the topic does also touch the matter on binary code language, rivalrous to legal alphabetic language. Lastly, the study aims at emphasizing the pivotal role of the jurist as an interpreter in a changing society accommodating diverging realms of reality. The study is structured as follows. Firstly, a quick exam of the traits of blockchain networks would provide the contextual link to establish the arguments in support of the need of a standard legal language. Secondly, a comparison between liberal legal institutions and theory of semiotics is set to perceive their functioning and ascertain their limits in the light of todays unprecedented changes. Thirdly, a summary on blockchain networks' legal features would constitute the thrust behind the idea of a uniform legal language. Methodologically, the argument does also establish some relations with classical laws of physics and philosophy of media. Its aim is to demonstrate how the suggested legal interpretation and semiotic-based approach can contribute to overcome existing stumbling blocks including, but not limited to, the lack of cooperation at the international level as well as the gap in State norms when it comes to innovation. In this sense, the proposed strategies do not intend to replace current advances in the legal thought. In contrast, it seeks to harmonise their results providing a methodical approach that can concur to inform a new technique to address new controversial issues. In practice, the proposed method regarding the adoption of a uniform legal language would lower transactive costs in terms of normative coordination in the matter of international cooperation and in the definition

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of applicable law among different legal systems. Alternatively, it might contribute to the convergence of legal systems and/or their underlying concepts. Differently put, article's contribution can be envisaged in fostering juridical consistency with regards to different forms of languages' coexistence.

Keywords Standard legal language · Blockchain networks · De Saussure · Legal interpretation · Law and the Arts · Pistoletto

'Die Grenzen meiner Sprache sind die Grenzen meiner Welt'[1] (L. Wittgenstein).

1 The Nature and the Legal Implications of Blockchain

For the sake of this study, a brief analysis of the blockchain will be carried out in order to grasp the elements of discontinuity with the past. In this respect, the blockchain is 'a method of recording data—a digital ledger of transactions, agreements, contracts, anything that needs to be independently recorded and verified as having happened.

In practise, 'the big difference is that this ledger isn't stored in one place, it's distributed across several hundred or even thousands of computers around the world. No one person or entity can control the data, which makes it transparent. The data forms blocks that are encrypted into a continuous chain using complex mathematical algorithms. Once updated, the ledger cannot be altered or tampered with, only added to, and it is updated for everyone in the network at the same time'[2].

By way of example, one can consider the sequence below (1–6) which describes the functioning of blockchain technology:

1. A wants to send money to B.
2. The transaction is represented as a block.
3. The block is transmitted to every node in the network.
4. The network nodes approve the transaction and validate it.
5. The next block can be added to the chain providing an indelible and transparent record of transactions.
6. Money goes from A–B.

Therefore, the following features emerge (Table 1).

As per the legal discourse, blockchain can be understood as the conjunction of 'two of the central legal devices of modernity: the ledger and the contract'[3]. In this regard, it is possible to perceive, at least in principle, an upgrade of existing legal

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[1] Wittengstein [67].

[2] Accenture and BBC [2].

[3] Maurer and Quinn [50].

tools. For the former, an analogy can be found in Roman Law's *Liber de Expensis* wherein the *pater familias* noted budget revenues and expenditures. It was considered an authoritative record in Roman law. Once an entry was made, it was challenging to alter or manipulate without raising suspicion. This permanence contributed to the security and enforceability of obligations in Roman contracts. Further, In the Roman legal system, the *Liber de Expensis* functioned as an intermediary-less record-keeping system. It reduced the reliance on individuals' trustworthiness, as the recorded obligations themselves served as evidence. While the *Liber de Expensis* did not possess self-executing capabilities like smart contracts, it played a crucial role in the legal system by providing a clear record of obligations, which could be used as evidence in legal disputes, thereby promoting accountability and enforceability.

In this wake, it is possible to grasp how this technology can empirically enable the overcoming of territorial-physical limits. Specifically, the ductility of the blockchain allows its cross-functional application making it a general-purpose technology like Internet and electricity[4].

More properly, while standard contracts contributed to significantly reduce transaction costs, the blockchain reduces them to zero. In this respect, Keynesian theory establishes a biunivocal relationship between contract and enterprise[5], qualifying the

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[4] Skolnikoff [62].

General Purpose Technologies (GPTs), also known as transformative technologies or foundational innovations, represent a distinct category of innovations that possess the capacity to reshape entire industries, economies, and societies. These technologies, characterized by their broad applicability and profound impact, have been a focal point of academic inquiry and policy discussions. This essay aims to elucidate the concept of General Purpose Technologies, examining their defining characteristics, historical instances, and their implications for economic growth and societal development.

At the core of the notion of General Purpose Technologies is their ability to serve as a foundation upon which a multitude of complementary innovations and applications can be built. GPTs are distinguished by their versatility, adaptability, and wide-ranging potential. They act as catalysts, triggering a cascade of innovations across various sectors, thereby driving economic growth and transformation.

Historically, GPTs have played pivotal roles in shaping the course of human civilization. The steam engine, for instance, marked a watershed moment during the Industrial Revolution. This GPT revolutionized transportation, manufacturing, and agriculture, ushering in an era of unprecedented economic expansion and societal change. Similarly, the information and communication technologies (ICT) of the late twentieth century, including the Internet and the microprocessor, served as contemporary GPTs that revolutionized communication, commerce, and information dissemination, catalysing the modern digital era. The impact of GPTs on economic growth is profound and enduring. These technologies create a virtuous cycle of innovation, investment, and productivity gains. The initial investment in GPTs and their subsequent diffusion across industries result in increased productivity, reduced costs, and improved quality of goods and services. This productivity growth, in turn, fuels higher living standards, income growth, and enhanced competitiveness on a global scale. Furthermore, GPTs exert a transformative influence on societal structures and dynamics. They reshape labour markets, alter consumer behaviours, and redefine business models. In the context of the digital revolution, for example, GPTs have given rise to new forms of work such as the gig economy, altered the nature of employment, and posed fundamental questions about privacy, security, and ethical considerations in the digital age. Despite their transformative potential, the deployment of GPTs is not without challenges and risks.

In conclusion, General Purpose Technologies are foundational innovations that possess the capacity to reshape economies and societies. Their versatility, impact across multiple sectors, and enduring influence make them subjects of considerable academic and policy interest. Historical examples, such as the steam engine and ICT, demonstrate the profound economic and societal changes that GPTs can catalyse.

[5] De Filippi et al. [18].

Table 1 Blockchain features

Features	Description
Decentralization	Blockchain operates on a peer-to-peer network, eliminating the need for a central authority or intermediary
Immutability	Once data is recorded on the blockchain, it cannot be altered or deleted without consensus from the network
Transparency	All participants in the network can view the data on the blockchain, enhancing trust
Smart Contracts	Self-executing contracts that automatically execute and enforce the terms of an agreement when predefined conditions are met

latter as 'a nexus of incomplete contracts'[6]. Hence, blockchain manages to factually bridge market failures zeroing asymmetries of information and related transaction costs.

Given that blockchain is a secure data structure and 'a protocol for establishing consensus on valuable information within a flat network without hierarchy'[7], the role of certifiers falls short. Practically, 'every user has a continuously authoritative copy. Anyone who has access to the ledger has access to the same full transaction history and the ability to verify the validity of all records'[8]. Then, the code 'enabling nodes in the network to interact with the data stored on a blockchain and act autonomously of some conditions are met is commonly known as a smart contract'[9].

For the sake of this study, It must first be said that this new emerging legal approach *flattens* the underlying hierarchy existing among state organs therefore questioning the role and position of statues, their formation, the State, and ultimately of the law itself. From the one hand, the inner traits of smart contracts can overshadow nuanced legal reasoning given the inflexibility of algorithms.

Overall, it should be remembered that algorithms process bulks of Data in an ahistorical, atemporal, and therefore a-contextual manner. By contrast, human-based decision-making (e.g. a court's decision) operates a deductive choice wherein the temporal dimension plays a central role for the qualification of facts.

In view of this, it is arduous to harmonise the algorithmic predictivity with the law's prescriptive trait. To continue, the human-machines collective intelligence appears to conflict with the traditional approach within legal regulation. The latter does consist of mutually exclusive modes of conducts pertaining to the rigid Roman taxonomy of *imperare*, *vetare*, *permittere*, and *punire* (D.1.3.7). As a result, it is indisputable that the zero-sum-game patterns of regulation may provide a certain decree of legal protection. In contrast, they may prevent the full development of opportunities, identities, and human dignity, as they are inherently conditional in their functioning.

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[6] Jensen [39].

[7] Davor and Sajter [23].

[8] Gervais [31].

[9] *Ibidem*, 312.

To illiuminate this, a short line of code for a simple Ethereum smart contract written in Solidity follows:

```
if (msg.sender == owner) {

    // Perform some action or transfer funds

}
```

In the provided code snippet, we have an 'if' statement that checks whether the sender of a transaction is the owner of the smart contract. If the condition is met, some action is performed, or funds may be transferred. For clarity, the system does neither ascertain nor consider the development of factual circumstances that might require other arrangements.[10]

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[10] The following passage provides some methodological clues to adjust the legal discourse to contemporrary societal needs through a comprehensive approach, see Williams et al. [66].

'Rather than argue whether, say, print on paper rights are different from e-book rights, or trying to distinguish between audio CD, audio download and radio, contracts might— in some contexts— be better off focusing on the consumer's acts of 'reading' or 'listening' regardless of the medium. Clearly much will depend on from which end of the grant of rights the contract is being reviewed as well as the other specific factors of the deal: exclusivity, term, other deals being entered into etc. Sticking closely to the technology, however hard that may be to specify, may still feel more comfortable for some. There may still be a wider benefit, however, regardless of the issues discussed above, in re-evaluating the nature of the deal and the way it is documented. In fact what we are getting down to is a debate about what it is to be a 'producer' or 'publisher' of digital content and how that needs to be reflected in commercial agreements. For example, is it just about deciding how and when access is granted to something, or more about branding and quality— about what should be selected and how it should be promoted? Or is the primary concern a continued need for project finance, ie funding talent through advances, allowing works to be created in the first place?

Actually this has not been such a defined process in the media business. In music, film, broadcasting and publishing the producer/publisher is usually left to get on with what it does best and industry contracts usually reflect that. This is less about bargaining power (although clearly the relative position of contracting parties is a factor) than certainty over what it is that is being produced: an album, a series, a film or a book. Contrast that with technology contracts where the development and production process is constantly reduced to a collection of specifications and procedures that can quantify and measure performance. Perhaps unsurprisingly, digital media products have often followed something of a middle ground. [...] Even without such fundamental considerations contracts need to take account of digital rights properly. It is no longer possible to hide them or the issues they raise in the boilerplate or secondary clauses in the hope no will notice or argue. Many traditional media documents also need updating more generally since digital issues will usually run right throughout a contract, not just the definition of rights. In some cases these raise very specific commercial questions. In book publishing, a common example is the author's reversion clause where the possibilities of digital media might mean a work never went 'out of print' under older clauses. More generally, however, many operative clauses may simply assume that material is delivered and exploited in physical form. Again, in book publishing, everything in an author agreement from 'proofs and production', 'cover artwork', and 'credit provisions' through to 'reserves' and 'remainders' may still be based entirely around print on paper. The practical answer is to step back and work out what any provision is actually trying to achieve. Contract wording is not magic— even though industry standards and expectations can sometimes seem to invest it with that power. Contracts can always be re-worded to do a different or better job. The updating does not have to be dramatic or extensive, it can be evolutionary not revolutionary, but it does have to be done. As we suggested in the previous section, copyright and the structures upon which it is based are likely to be around for some time to come. Obviously it will pay to keep an eye on tweaks and changes to that legal framework— as it always has done— but the basic rules of the game will likely remain the same. It is the contracts that will have to change; though not necessarily dramatically. It is often less about how many changes we make

On the other hand, it is possible to inscribe these processes into Heideggerian notion of *Ge-stell*.[11] The German expression *Ge-stell* itself is a compound word that combines 'Ge' (en) and 'Stell' (to position or to frame). Heidegger employs this term to signify the essence of technology, characterizing it as a pervasive and controlling force that frames our understanding of the world. *Ge-stell*, in Heidegger's view, represents a mode of revealing, or *enframing* that challenges forth everything as a calculable resource. Therefore, its impact on society is profound. It has led to a world dominated by technology, where human beings are increasingly alienated from nature and authenticity. The commodification of the natural world and the reduction of human existence to mere efficiency have become hallmarks of this technological age.

Further, in keeping with Heidegger, such unharnessed technological process reinforces the 'destruction of Being' (*Destruktion des Seins*). In turn, this concept highlights how traditional structures and meanings can be flattened in the face of modern technology. Heidegger argues that technology threatens to reduce the depth and authenticity of human experience, creating a flattened existence characterized by instrumental rationality.

As per the legal discourse, the current state of the affairs departs—almost in a scratching manner—from the classic multi-layered, and therefore inherently dialectical dimension of the law. As Kaufmann puts it, 'The State does not create the law; the State creates statutes, and both the State and statues are subject to the law'.[12] Against this backdrop, advances in technology challenge the very essence of the notions of State, statues, and the law itself. In keeping with the above, it is necessary to dwell on the possible semantic ambiguities of the term smart contract to grasp its implications over the contract and society.

Smart contracts are 'autonomous software agents [...] that automatically respond to inputs according to pre-programmed parameters'[13]. Hence, there is no link with the 'complex social dimension of contracts'[14] as 'the finality of executed code reduces the agency of individuals involved'.[15] As a consequence, code appear the exclusive component in this process at the detriment of the law[16]. In this respect, it is possible to test these elements against traditional contractual components.

The table below (Table 1) compares blockchain's features (cf. Table 2) against Contract Law Pillars.

From the above comparison, a contrasting outline emerges.

Footnote 10 (continued)

and more about how much thought we put into those changes'.

[11] Heidegger [37].

[12] Kaufmann [41].

[13] Limata [46].

[14] Rantala [55].
    The author quotes O'Hara, Kieron. 2017. Smart Contracts – Dumb Idea. In *IEEE Internet Computing* 21: 2, 97–101, 2017.

[15] *Ibidem.*

[16] Rodrigues [56].

In brief, the syntagma smart contract is a misnomer[17] for a twofold reason.

Firstly, the automatic execution of pre-defined tasks upon the occurrence of certain conditions excludes human agency a priori. Secondly, and in principle, there are no prerequisites to frame smart contracts within conventional contractual paradigms[18]. So, some reflection is called for the will theory of obligation considering blockchain networks' manifest detachment from established contractual patterns. Analogies can be found in public callings carried on by big corporations with which individual (i.e. consumers) was not in a position to bargain and therefore to assert their interests.[19] Additionally, the practice of standard term insertion 'has the advantages of saving time and creating standard patterns of dealing so as to enable parties to know what sorts of risks they will have to bear and cover by insurance. On the other hand, it has also been used by commercial suppliers of goods and services to exploit and abuse superior bargaining power, especially in contracts with consumers'.[20]

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[17] Deloitte's [19]. https://www2.deloitte.com/content/dam/Deloitte/cz/Documents/financial-services/cz-2018-deloitte-global-blockchain-survey.pdf (last accessed on 26th April 2023).

[18] Cf. Smart legal contracts' classification below.

As per Fairfield and Selvadurai [26], we can note what follows. The traditional legal approach can hinder the integration of blockchain technology into the legal discourse in several ways.

First, traditional legal systems are often slow to adapt to new technologies. This is because legal systems are based on established legal principles and precedents, which can be difficult to apply to new and emerging technologies. As a result, it can take years or even decades for legal systems to catch up with technological advancements, which can hinder the integration of blockchain technology into the legal discourse.

Second, traditional legal systems are often based on formal language, which can be difficult to reconcile with the natural language used in smart contracts. Smart contracts are self-executing contracts with the terms of the agreement between buyer and seller being directly written into lines of code. They are designed to facilitate, verify, and enforce the negotiation or performance of a contract. However, the formal language used in traditional legal systems can be difficult to translate into the natural language used in smart contracts, which can hinder the integration of blockchain technology into the legal discourse.

Third, traditional legal systems are often based on centralized authority, which can be difficult to reconcile with the decentralized nature of blockchain technology. Blockchain technology is designed to be decentralized, meaning that it is not controlled by any single entity or authority. This can make it difficult for traditional legal systems to regulate and enforce blockchain-based transactions, which can hinder the integration of blockchain technology into the legal discourse.

Overall, the traditional legal approach can hinder the integration of blockchain technology into the legal discourse by being slow to adapt to new technologies, relying on formal language that is difficult to reconcile with the natural language used in smart contracts, and being based on centralized authority that is difficult to reconcile with the decentralized nature of blockchain technology.

[19] In this respect, 'American courts started out by holding that professing a public calling was a legal transaction and defining the terms and consequences of such a transaction'.

See Pound [54].

The author does also refer to Gordon v. Hutchinson, I W. & S. 285 (Pa. 184).

In this respect, businesses recur to standard contracts. Overall, their underlying logic lies in the following consideration:

'Businesses incur the costs of drafting a standard contract only once and spread them over as many transactions as they use the contracts. Standard contracts also make a business' s legal risks more manageable by making them more uniform, also effecting a cost saving'. See Slawson (1996).

[20] Burrows [11].

Table 2 Blockchain features and Contract Law pillars

Features	Contract law pillars	Description
Decentralization	Central authority or intermediary	Blockchain eliminates the need for a central authority or intermediary to validate, execute, or enforce contracts, which challenges the traditional role of courts, arbitrators, and regulators in contract law
Immutability	Modification and termination	Blockchain ensures that data recorded on the ledger cannot be altered or deleted without consensus from the network, which limits the possibility of modifying or terminating contracts by mutual agreement, mistake, frustration, breach, or other legal grounds
Transparency	Confidentiality and privacy	Blockchain allows all participants in the network to view the data on the ledger, which enhances trust but also raises issues of confidentiality and privacy for the parties to a contract
Smart Contracts	Formation and interpretation	Blockchain enables self-executing contracts that automatically execute and enforce the terms of an agreement when predefined conditions are met, which may affect the formation and interpretation of contracts by requiring offer and acceptance, consideration, intention, certainty, and completeness to be expressed in code

At this point, it can be observed how the blockchain *transfers* the cost of trust and coordination[21] to the network alone. Thus, it overcomes the above-mentioned hierarchy-centred Keynesian approach and Kaufmann's theorisation.[22]

Hence, it can be witnessed that trust is shifted from subjects having decision-making powers (e.g. judges and notaries) to the mere authenticity of transactions. From another angle, the reliance on third parties disappears[23] and trust is entirely placed in the blockchain 'to bridge over the uncertainty about the future'[24]. In line with this, it follows that 'untrusted members can interact verifiably with each

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[21] Murck [52].

[22] The emergence of legal environments on the blockchain echoes the systematisation of writs during the medieval period. Writs were technological artifacts that linked human conduct to the enforcement institutions of the courts. Similarly, blockchain technology links digital conduct to the enforcement mechanisms of the network.
 Writs were a form of legal documentation that allowed individuals to make claims in court. They were standardized legal forms that were used to initiate legal proceedings and were issued by the courts. Similarly, smart contracts on the blockchain are standardized digital forms that can be used to initiate and execute legal proceedings. Writs were a way of translating physical temporal reality into the symbolic register of the writs. The legitimacy of the writ depended on its vindication by institutions of enforcement. Similarly, smart contracts on the blockchain translate real-world events into digital code, and their legitimacy depends on the enforcement mechanisms of the network. In both cases, the technology provides a standardized way of documenting legal transactions and enforcing them. The emergence of smart contracts on the blockchain is seen as a continuation of the historical trend towards the systematization of legal documentation and the use of technology to enforce legal claims. For more details, see Goldenfein and Leiter [32].

[23] For more details, see Miscione [51].

[24] *Ibidem.*

other without the need for a trusted authority'[25]. Vividly, Reid Hoffman coined the expression 'trustless-trust'[26]. In his own words, 'on a blockchain network nothing is assumed to be trustworthy… except the output of the network itself'[27], [28].[29]

In this respect, it could be convenient to refer to English ruling of *Bowen LJ, Sounders v Maclean*[30] to grasp the implications of this technology. More precisely, it reads as follows: 'Credit, not distrust, is the basis of commercial dealings: mercantile genius consists principally in knowing whom to trust and with whom to deal, and commercial intercourse is no more based on the supposition of fraud than it is on the supposition of forgery'.

Analogously, it descends that 'we have to be able to trust the blockchain, and to trust that no one controls it'[31]. Additionally, the nature of tokens is very flexible as

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[25] Casino et al. [13].

[26] Werbach, Kevin. 2019. *The blockchain and the new architecture of trust*. Cambridge.

[27] *Ibidem*, 24.

[28] In such a network, block-chain technology enforces transparency and guarantees eventual, system-wide consensus on the validity of an entire history of transactions. As current blockchain technology can not only process monetary transactions but can also ensure that transactions comply with programmable rules in the form of ''smart contracts'' (Tschorsch F, Scheuermann B (2016) Bitcoin and beyond: a technical survey on decentralized digital currencies. IEEE Commun SurvTutor 18(3):2084–2123). See also Abderahman [1].

[29] To continue mutual interpersonal trust can be framed as the basic element of the idea of community as a web of understandings about social relations (Cotterrell 1995: Chapter 15).

[30] Bowen and Sounders [8] 11 QBD 327,343. The case concerned a contractual dispute between Sounders and Maclean, both of whom were engaged in the shipping industry. Sounders had chartered a ship from Maclean to transport cargo, and a dispute arose when the ship encountered delays, resulting in financial losses for Sounders. The central question before the court was whether Maclean, as the shipowner, had violated the trust Sounders had placed in him by not providing a seaworthy ship for the agreed-upon journey.
Bowen LJ's judgment emphasized the fundamental principle that underlies all contractual transactions: the existence of a trust or confidence between the parties. In any contract, there is an implied duty of trust and confidence that each party must fulfill. In the case of a ship charter, the shipowner is entrusted to provide a seaworthy vessel, and the charterer trusts the shipowner to deliver the cargo safely.
Bowen acknowledged that trust is implicit in many commercial transactions, particularly in transactions involving services, such as the chartering of a ship. He highlighted that trust forms the basis of all agreements and is essential for the smooth functioning of commerce. In the context of the Sounders v. Maclean case, trust was manifested in the expectation that the ship would be fit for its intended purpose.
However, Bowen also clarified that this trust does not imply absolute guarantees. It is not an absolute or unconditional warranty. Instead, trust in contractual relationships is based on a reasonable standard of care and diligence. In the case of Maclean, the shipowner, he argued that Sounders could not expect an absolute guarantee of seaworthiness but rather a reasonable assurance that the ship was in a fit condition for the voyage. Bowen observed that, in this instance, the ship had been delayed by adverse weather conditions, which were unforeseeable and beyond the shipowner's control. Therefore, Maclean had not breached the trust by providing an unseaworthy vessel.
Bowen's judgment in Sounders v. Maclean emphasizes that trust in transactions is an inherent element of contract law. It is founded on a reasonable expectation of performance, but it does not entail an absolute guarantee. Trust is vital for the efficient functioning of commerce, and the courts will protect this trust by ensuring that parties fulfill their contractual obligations with due diligence. In this case, the court found that Maclean had not violated Sounders' trust, as the delay was beyond his control, and he had acted reasonably in providing the ship. Thus, the judgment reinforced the importance of trust while maintaining a balanced view of what trust entails in contractual relations.

[31] Werbach (2019).

they are a set of rules encoded in a smart contract. In turn they are *representations* of 'almost anything: a unit of virtual currency, an asset, physical object, or any other abstract entity'[32].

To clarify the above, let us briefly dwell on two examples that concern the activity of the judge, understood as an organ of the State[33]. Let us consider, for example, the case of a debtor who does not pay the sum of money to the creditors stipulated in the judgment. In many jurisdictions, the creditor may proceed in such a case with execution on the debtor's assets. In this case, the competent court will usually order the debtor's employer to start deducting a certain amount from the debtor's salary to satisfy the creditor. This possibility is not, however, unlimited, as it is intended to ensure that the debtor maintains a minimum subsistence level. Obviously, the rationale behind this rule is the need to balance the creditor's right to obtain the money with the need to preserve the debtor's basic needs and rights. Similarly, a landlord seeking to enjoy eviction of the tenant would not be able to achieve this result with immediate effect: this is true even where there are legitimate grounds for eviction. National tenancy law requires that the tenant be given a minimum amount of notice in order to balance the landlord's right to regain possession of the house with the tenant's need to find an alternative solution for his accommodation. Therefore, the enforcement procedures established by state law require a certain period of time not only because instantaneous coercion[34] is not practically feasible, but also and especially in order to balance the opposing interests of the parties[35]. In contrast, the blockchain network does not—by its very nature—envisage either the presence of the judge (interpreter), or the balancing of the interests at stake, or (to give just one example) respect for human rights[36][37]. And with respect to the two aforementioned examples, the smart contract could make an automatic deduction[38] from the wages of the defaulting tenant and might be able to recover his money efficiently, without the need to rely on state-mediated procedures that impose an expected rate of return. In the case of eviction, the use of automatic locks managed through blockchain technologies can make it immediately impossible for the tenant to gain access to the house once the landlord activates the eviction through software scripts. The same does also apply to risk assessment procedure in insurtech to the possible detriment of the insured/weaker party[39] [40][41].

Now, while it is true that and blockchain technologies can ensure that individuals can autonomously achieve what the state traditionally would not allow by virtue of

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[32] Gervais, note 9, 314.

[33] Blemus [7].

[34] Lessig [45].

[35] Kolber [43].

[36] Fairfield [25].,

[37] Wright and De Filippi [68].

[38] Garcia-Teruel [29].

[39] Garcia-Teruel [29].,

[40] Baker et al. [5].,

[41] Werbach and Cornell [65].

the above considerations with speed and efficiency. Hence, while some extol the virtues of blockchain technologies, emphasising the significant gains in efficiency and reliability, it is time to recognise that there may be another dark side to the often-extreme automation of justice. It follows that we must consider how rights, particularly constitutional rights, can be protected in the context of the technological environment where, as mentioned above, the binary code reigns and does not seem likely to embed fundamental rights, essential to civil coexistence[42]. Albeit with difficulty, Western democracies can incorporate the discourse of rights into their legislative processes. At present, there are no similar mechanisms with respect to the normative capacity of technology. Such reflections emerge from time to time in doctrine that glimpses the risk of the rule of law being literally devoured by the economic force of private powers governing the digital world[43]. In that regard, blockchain technology has a regulatory capacity (however debatable) that reaches beyond the state and national borders. In this sense, it can be argued that it represents, in a certain sense, a transnational system of rules in direct contrast with State jurisdiction, and ultimately with Sovereignty. In this vein, it is possible to inscribe the most complete piece of State norms on blockchain as a form of reaction towards these trends that can, at least in perspective, erode the prerogatives of sovereign States as shown. Precisely, the Principality of Liechtenstein (with the *Blockchain Act*), and the Republic of Malta (with the *Malta Digital Innovation Authority Act* (MDIA Act), and the *Virtual Financial Assets Act* (VFA Act) issued statutes enabling strong forms of control within State organs along with sanctions. Nonetheless, the following regulatory gaps emerge giving room to ambiguity or providing margin for a prospective enhancement of legal interpretation as this study points at.

More precisely, the MDIA Act introduces the concept of 'innovative technology arrangements' and the role of the Innovative Technology Arrangement Recognition Certificate (ITAR). However, it does not provide a comprehensive definition for 'innovative technology arrangements'. This lack of specificity leaves the interpretation open-ended, making it challenging for businesses to discern the precise scope and applicability of the law.

The VFA Act introduces the term 'virtual financial asset' without offering a clear definition. The absence of precise boundaries can lead to differing interpretations, creating inconsistencies in how this legislation is applied. This ambiguity hinders the harmonization of legal standards, both domestically and on a global scale. Similar considerations can extend to Liechtenstein's Blockchain Act as well. Concretely, it introduces the concept of 'registered tokens' without providing a comprehensive definition. This imprecision can lead to confusion regarding the criteria for such tokens, potentially allowing for diverse interpretations by authorities. Consequently, companies may face compliance challenges, thereby impeding harmonization efforts. Moreover, the Blockchain Act grants regulators significant discretion in certain aspects of regulation. For instance, it empowers the Financial Market Authority (FMA) to determine the "necessary qualifications" for those engaging

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[42] Cremona [16].

[43] Hildebrandt [38].

in token issuance or providing token custody services. The broad discretion can result in different standards being applied to various businesses, causing regulatory fragmentation.

Further, international private law provisions and categories are currently found inconsistent with today's legal thinking since they do not correspond to smart contracts functioning and their practical needs. Specifically, PRIMA Model and the Factual PRIMA as of the Hague Convention presuppose the existence of intermediaries not existing as such in the blockchain[44]. The Table 3 does contrastively outline the divergences existing between Blockchain Features and the Status of Intermediaries in International Private Law.

Moreover, the criteria of *lex rei sitae* can be difficultly met considering the aterritorial nature of the internet and thus, leaving room to the problem of mobility in private international law.[45]

Analogously, at a sentencing level, clarity is still missed. Although the landmark Singaporean Court's *Quoine* decision[46] establishes guidelines and principles, it

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[44]   De Vauplane [21].

[45]   As Guillaume (2018) puts it: 'The blockchain calls the traditional approach of private international law into question, since in reality it is impossible to establish the geographical location of blockchain transactions'. Then, the author indicates similar references on the matter.

 Same opinion: Graham-Siegenthaler and Furrer (supra n 47), 9 ('The blockchain has no such "closest connection" to any jurisdiction worldwide. '); Melanie Dulong de Rosnay, 'Peer-to-Peer as a Design Principle for Law: Distribute the Law', Journal of Peer Production (January 2015), Issue 6, accessed 9 February 2018 at http:// peerp rod ucti on.n et/issues/issue-6-d i sru pti on-and-th e-1 a w / peer-revi ew ed-artic les/ peer -to-peer-as-a-design-princip le-for-law-distribute-the-law (' D istributed architectures fragment data and actions, thus challenging the localised rights model where each object or right can be assigned to one actor. The problem cornes from the fact that peer-to-peer architectures aggregate and distribute technically insignificant fragments, while the law allocates rights and responsibilities to individual persons').

 Guillaume [36].

[46]   *[2020] SGCA(I) 02*.

 The *Quoine* case revolves around the Singapore-based cryptocurrency exchange, Quoine, and its dispute with B2C2, a cryptocurrency market maker. In 2017, Quoine executed a series of cryptocurrency trades on its platform, resulting in a significant error. B2C2 had placed orders to sell Ethereum at an exchange rate that was vastly out of sync with the market. Consequently, B2C2 acquired a substantial amount of Bitcoin from Quoine at an advantageous rate. Quoine, realizing the mistake, proceeded to reverse the transactions, effectively canceling the trade. B2C2 brought a lawsuit against Quoine for breach of contract, claiming that the executed transactions were legally binding. The case eventually reached the Singapore Court of Appeal, leading to the pivotal decision in [2020] SGCA(I) 02.

 One of the primary legal gaps exposed by the *Quoine* case is the jurisdictional ambiguity surrounding blockchain transactions. The case involved parties from multiple jurisdictions, which made it challenging to determine which legal framework should apply. Blockchain's decentralized nature transcends national borders, posing a significant challenge for regulators. In that regard, room is left for legal scholars to delve into the question of how cross-border blockchain transactions can be effectively governed and whether international harmonization of blockchain regulations is a feasible solution. The *Quoine* case also underscores the ambiguity surrounding the legal status of smart contracts. In this instance, the trades in question were executed using smart contracts, which are self-executing, code-based agreements. The case raises questions about whether these contracts should be legally binding and enforceable, and if so, under what conditions. Additionally, the role of intermediaries, like cryptocurrency exchanges, in ensuring the legality of smart contracts is another area requiring academic exploration. Concretely, The legal status of cryptocurrencies varies significantly from one jurisdiction to another. In some places, they are

does not explicitly answer whether the automated nature of platforms can give rise to legal obligations. In concrete, the decision confirms an English case law's precedent[47] holding that data inputs in a piece of software represent an offer. More properly, the Quoine case highlighted the need for robust regulatory oversight of cryptocurrency exchanges. As the number of exchanges increases, the risk of disputes and

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Footnote 46 (continued)

considered as commodities, while in others, they are treated as securities. This lack of uniformity can create confusion and hinder the development of blockchain-based financial markets. Legal scholars can contribute by examining the potential for a standardized classification of cryptocurrencies and their associated legal rights and responsibilities.

[47] *Thornton v Shoe Lane Parking* [63] *2 QB 163. Thornton v Shoe Lane Parking* revolved around the legal issue of whether an automated ticket dispensing machine's output, stating the cost of parking, could be deemed an offer, thereby creating a contractual obligation upon acceptance by a user who deposited the specified fee. The case confronted the ambiguity associated with ascertaining when a statement can be considered an offer, which is crucial for determining contractual validity.

At the heart of the case lay the ambiguity of whether the machine's output constituted an offer or a mere invitation to treat. An invitation to treat is an expression of willingness to negotiate or an invitation for another party to make an offer, while an offer, when accepted, binds the offeror to a contract. The critical distinction between these concepts depends heavily on interpretation and context. Lord Denning, in his judgment in *Thornton v Shoe Lane Parking*, recognised the perplexing nature of offers, particularly in modern, automated contexts. He argued that the ticket machine's output was not an offer but an invitation to treat, suggesting that it merely indicated the parking price and invited potential users to make an offer by depositing the stipulated fee. This interpretation aligned with the idea that offers should emanate from human intention rather than automated processes. Lord Denning's approach highlighted the significance of context in determining whether an expression is an offer or an invitation to treat. However, Justice Blackburn offered a dissenting perspective. He contended that the machine's output, indicating the price for parking, should be regarded as an offer. His view emphasized the importance of clarity and predictability in contractual relationships, suggesting that an automated machine's statement, which is accepted by the user through the deposit of money, should create a binding contract. This dissent underscores the subjective and interpretive nature of defining an offer.

The ruling highlights the ever-present challenge in the field of contract law concerning the application of traditional principles to modern, technologically advanced contexts. The case raises questions about the adequacy of existing legal concepts, such as offers and invitations to treat, to adapt to the complexities of contemporary commerce.

In the case of *Thornton v Shoe Lane Parking*, the ambiguity of what constitutes an offer came to the forefront, highlighting the interpretive nature of legal principles in contract law. The distinction between an offer and an invitation to treat is not always clear-cut, and it often depends on the specific context and the court's interpretation. This case demonstrates the need for legal principles to evolve alongside technological advancements and novel commercial practices, maintaining their effectiveness in a rapidly changing legal landscape.

errors grows as well.[48] Regulatory gaps in this domain can lead to instances like the one in question. Legal academics should investigate the best practices for regulating cryptocurrency exchanges, including licensing requirements, security measures, and dispute resolution mechanisms. In the remainder of the paper the attention will be drawn into the individuation of some viable strategies embracing the legal discourse as a method rather than focusing on norms and their exegesis alone.[49] In this sense, flexibility can avoid *lopsided regulatory impacts*.[50] Differently put, public bodies and private organisations.

can therefore be effectively enabled to adapt to changing circumstances and new technologies.

Against this background, we may consider law and advances in technology as mutually exerting friction on each other as per the equation below.

$$F_f = \mu F_n$$

This formula tells us that the force of friction (F_f) is directly related to the normal force (F_n) and the coefficient of friction (μ). The more the normal force or the coefficient of friction, the greater the force of friction. Conversely, if the normal force or the coefficient of friction is reduced, the force of friction decreases.

In what follows, the discussed approaches would try to hint at possible ways to lower these forms of friction.

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[48] The case delves into the question of property rights in digital assets, which are fundamentally different from traditional physical assets. The courts in the *Quoine* case needed to consider whether the ownership of cryptocurrency is akin to the ownership of a tangible asset. Academic inquiry should focus on the conceptualization of property rights in the digital age and whether existing legal principles can effectively apply to blockchain-based assets.

[49] While statutory interpretation is undeniably important, it often reduces the law to a set of static, textual rules. This approach disregards the dynamic nature of the legal system, where legislative intent and textual clarity can sometimes be elusive. It fails to accommodate evolving societal norms, technological advances, and unforeseen circumstances, necessitating a broader method that can address these complexities.
 For more details, s. William N. Eskridge Jr. and Philip P. Frickey, 1990. Statutory Interpretation as Practical Reasoning. Standford.

[50] Mackenzie-Gray Scott and Abrusci [48].
 Overall, an oversight mechanism is a system or process that is put in place to monitor and regulate the activities of an organization or industry. In the context of ADM, oversight mechanisms are designed to ensure that existing legal frameworks, as well as any new additional regulations, are appropriately applied to ADM systems. Oversight mechanisms can take different forms, such as public bodies like legislatures, regulators, and courts, or private companies' internal guidelines and review processes. The goal of oversight mechanisms is to minimize risk, impact, and potential harms on individuals and groups that may arise from the use of ADM systems.

2 The Interplay of Law, Semiotics, and Legal Interpretation

> «There can be no question of interpreting code. Code does not have a meaning; it has an effect. The only question can be whether the code fits with any natural language term of statement that preceded or accompany it».[51].
> (H. Beale).

Overall, it can be said that the work of a lawyer consists of the pairing between the abstract content of a norm (I) and a concrete factual case (II). To put it differently, this process is also known as the legal inference, which is based, in turn, on Aristotelian syllogism. In this framework, the jurist is an interpreter enabling the semantic transfer between (I) and (II). In the remainder of the article, some strategies will be analysed to limit the possible algorithmic drifts producing a stall in the legal discourse. In this respect, they can depart from the classic understanding of judge as *bouche de la loi*.[52] Although the law can be considered as a computational process, it can be exposed to computational systems' inherent rigidity. In turn, it can lead to failures when they encounter real-world complexity, exceptions, or deviations from their predefined rules.

Mathematically, this rigidity can be represented by a function *f* that maps inputs (*x*) to outputs (*y*):

$$y = f(x)$$

In a highly rigid computational system, this mapping is often one-to-one, with a narrow range of acceptable inputs and specific transformations leading to outputs. As noted above as per the example of the debtor, when *x* falls outside the predefined boundaries or the transformation process is sensitive to slight variations, failures occur.

Methodologically, the suggested strategies can be inscribed into the logic of trade-offs.[53] Yet they can dismiss a dichotomic approach that may either regard empowering state norms or—alternatively—fostering international cooperation. In contrast, their outcome tends to make the two aspects converge by reducing underlying transactive costs also in line with the equation concerning the reduction of friction. Accordingly, a uniform legal language would simplify the interactions with traditional legal systems and new technological advancements by enhancing the

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[51] *Smart legal contracts Advice to Government*, UK, 2021, 88.

[52] This principle upholds the idea that judges should merely be the 'mouthpiece of the law' interpreting statutes without adding personal interpretation or policy considerations. While this approach has provided stability and predictability in legal decision-making, it also has its limitations. According to this principle, judges are considered the mere vehicles through which the legislator's intent is conveyed, and their role is limited to the literal interpretation of statutes. This approach emphasizes textual fidelity and has traditionally been viewed as a safeguard against judicial activism, ensuring that the law remains consistent and objective. As a result, can foster legal formalism, which may lead to a disconnect between the law and the lived experiences of individuals. It can create a perception of the legal system as detached from the realities and needs of society.

[53] Lee et al. [44].

Table 3 Blockchain features and intermediaries in International Private Law

Blockchain features	Status of intermediaries in international private law
Decentralization	Intermediaries in international private law are not decentralized. They often act as central points of control or authority
Immutability	The actions and decisions of intermediaries in international private law can be challenged, modified, or reversed through legal processes. This contrasts with the immutability feature of blockchain
Transparency	While some aspects of intermediaries' operations may be transparent, others may not be due to confidentiality or other legal considerations. This is different from blockchain's feature of transparency where all network participants have a copy of the ledger
Smart Contracts	Intermediaries in international private law do not inherently possess a feature comparable to smart contracts. However, they may utilize contracts and agreements as part of their operations

process in a fashion similar to that of legal transplants.[54] In so doing, the disputed issue of legal translation evolves into a more fluid semantic transfer. In turn, legal transfers depend on the notion of metaphors[55] as they imply a semantic correspondence for a relation to be established. Hence, 'legal transfer is conceived of as a transfer of information. Information 'is a difference which makes a difference', meaning that the information received has a certain importance to the receiving system […]. In order to facilitate a transfer process, certain 'facilitators' have to exist[56].

This study does therefore hint at uniform legal language as facilitator because of its capability of filling the gaps together with the protection of fundamental rights including but not limited to freedom and dignity.[57] More precisely, the intersection of law and technology lacks uniformity when it comes to the individuation of new legal concepts—set on terms—that can properly accommodate new emerging circumstances. In this sense, a uniform legal language can concur to establish an

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[54] For the sake of this study, it should be remarked that legal transplants do not consist of mere mechanical transfers of rules but they are rather complex processes that involve adaptation, reinterpretation, and amalgamation with local legal traditions. Overall,this approach highlights the dynamic nature of legal transplants and their capacity to shape the recipient legal system in unique ways. For more details, cf. Watson [64].

[55] A metaphor is a rhetorical device that, by drawing an implicit comparison between two seemingly unrelated concepts, enriches the meaning of the subject by suggesting hidden similarities. This figurative language tool, as described by Aristotle in *Poetics*, serves to create vivid imagery and stimulate creative thought by substituting a tangible idea or image with an abstract one, thereby inviting the audience to explore deeper layers of meaning within the context.

[56] Seckelmann [60].

[57] For the influence of legal paradigms over society, s. Law in time Yale Journal of Law & the Humanities, Vol. 31, Iss. 2, Art. 5 'Ultimately, though, legal systems are able to constitute the type of order characterized by social stability as constant normative change only inasmuch as legal actors internalize, act out and act upon a paradigm of law in a way that smooths out inescapable and irreducible functional-axiological tensions. And as the law of high complexity societies unfolds in time, it is only because of paradigms of legal thought that legal systems are able to assume what is often referred to as their autopoietic—significantly self-referential, self-reproducing, and self- validating—and autotelic (formalist) capabilities. The upshot for legal historians is that any kind of legal history fails adequately to account for the viewpoint of legal actors unless it incorporates in its narrative the way in which paradigms shape thoughts and attitudes'.

effective interoperability between law and technology embedding aspects related to fundamental rights.

To come full circle, this process can be consonant with Horowitz's *Hermeneutic Contextualism* given that it can more aptly determine the truth-conditional content of metaphors. In turn, it essentially depends on the interpreter of an utterance and is thus closely tied to the subject and their interpretation.[58]

In this context, reference can be made to Kantian logical use of understanding given the interplay between thinking and concepts.[59] As a result, this method can shape the progressive formation of the legal discourse as a *register*[60] also containing new facets pertaining to technology through a more flexible usage of terms as fundamental linguistic units representing specific concepts or objects.[61]

Further, De Saussure[62] aptly theorised the above in terms of general semiotics principles. He established a relation between the signifier (i.e. a word or concept) and the signified (i.e. the reference to which a given word or concepts hints at). As Searle puts it: 'the semantic properties that contribute to content can be roughly reduced to the referential and the predicative meaning of expressions[63]'. To continue, uniform legal language's flexibility would concur to reinforce the notion of *parole* in De Saussure's theorisation in a time of continuous change. Indeed, *parole* is dynamic and variable, constantly evolving and adapting to specific contexts, while (legal) langue remains relatively stable and fixed over time.

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[58] Conrad and Petrus [14].

Halliday [15].

[59] 'Alle Urteile sind demnach Funktionen der Einheit unter unseren Vorstellungen, da nämlich statt einer unmittelbaren Vorstellung eine höhere, die diese und mehrere unter sich begreift, zur Erkenntnis des Gegenstandes gebraucht, und viel i) mögliche Erkenntnisse dadurch in einer zusammengezogen werden. Wir können aber alle Handlungen des Verstandes auf Urteile zurückführen, so daß der Verstand überhaupt als ein Vermögen zu urteilen vorgestellt werden kann. Denn er ist nach dem obigen ein Vermögen zu denken. Denken ist das Erkenntnis 5) durch Begriffe. Begriffe aber beziehen sich, als Prädikate möglicher Urteile, auf irgend- 20 eine Vorstellung von einem noch unbestimmten Gegenstande. So bedeutet der Begriff des Körpers etwas, z. B. Metall, was durch jenen Begriff erkannt warden kann. Er ist also nur dadurch Begriff, daß unter ihm andere Vorstellungen enthalten sind, vermittelst deren er sich auf Gegenstände beziehen kann. ES6) ist also das Prädikat zu einem möglichen Urteile, z. B. ein jedes Metall ist ein Körper'. Kant, Immanuel. 1871 Kritik der reinen Vernunft. Koenigsberg. 1. Abschnitt. Von dem logischen Verstandesgebrauche.
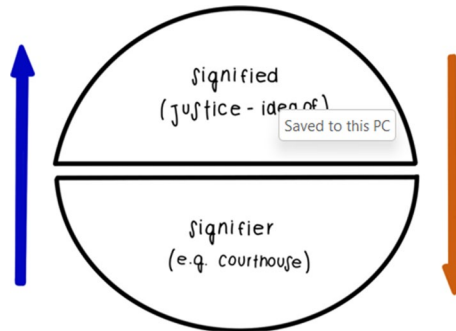
[60] Register, as conceived in systemic functional linguistics, is a central component of Halliday's theory (1969). According to this perspective, language serves various functions and adapts to diverse social contexts. Register is the manifestation of these adaptations. It encompasses the choice of vocabulary, grammar, and discourse strategies in response to situational factors, such as the participants, the field of discourse, and the tenor of relationships.

[61] It can be worth noting that 'A code, in a sense, is an attempt to "freeze" the law at one particular moment in time but, of course, society does not stand still. The problem then arises as to how the judiciary, faced with an apparently comprehensive code and a prohibition, or at least deep suspicion, of judicial law-making, can find the necessary leeway to develop the law so as to take into account both individual circumstances and general changes in society at large. The answer to this lies partially in the irredeemable ambiguity of the language of code'.

Cf. Forte [27].

[62] De Saussure [20].

[63] Searle [59].

By way of example, the diagram below shows this theory's functioning establishing a relation between the abstract concept of justice (the blindfolded goddess—*signifier*) and its empirical equivalent (the courthouse—*signified*).

When considering the advent of blockchain networks it is self-evident that this paradigm is severely challenged as facts happen beyond or outside the realm of State *normopoiesis*. Under a formal standpoint, symbols and code are added to plain language producing a multi-layered framework wherein these three components converge.

Accordingly, the tripartition of state, law and statutes[64] and their roles is deemed to be re-framed. More precisely, it should be noted a re-emergence of Weberian *Gemeinschaft*[65] in relation to the fluidity e-communities show.

As noted above, it is possible to grasp the ambivalence of both the law, and its prospective objects of regulation. Therefore, decision makers ought to develop a new, more fluid, dialectic approach for tackling the Fourth Revolution challenges. More specifically, humans, as organisms living in the ecosphere, are now adapting to the additional environment of the infosphere.

In this respect, the following classification of smart legal contracts will contribute to clarify the strategic importance of a standard legal language.

More precisely, they consist of the following[66]:

(1) Naturallanguage contract with automated performance.
(2) Hybrid contract.
(3) Solely code contract.

Therefore, it should no surprise that a smart legal contract can assume the form below.

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[64] Kaufmann [41].

[65] Giesing, Benedikt [33].

[66] The classification is taken from *Smart legal contracts Advice to Government*, UK, 2021, 89. Previously, the report in-depth describes the above classification as follows:

'The form a smart legal contract takes will depend on (amongst other things) the smart contract platform, the parties' requirements, and the relevant use case. Although smart legal contracts can take a variety of forms with varying degrees of automation, it is helpful (for the purpose of the legal analysis) to consider three broadly-defined forms.

(1) A natural language contract in which some or all of the contractual obligations are performed automatically by the code of a computer program. The code itself does not define any contractual obligations, but is merely a tool employed by one or both of the parties to perform those obligations. This type of smart legal contract can also be referred to as an "external" contract, as the code falls outside the scope of the parties' legally binding agreement.

(2) A hybrid contract in which some contractual obligations are defined in natural language, and others are defined in the code of a computer program. Some or all of the contractual obligations are performed automatically by the code. At one end of the spectrum, the terms of a hybrid contract could be primarily written in code with a few natural language terms setting out, for example, the governing law and jurisdiction. At the other end of the spectrum, the terms of a hybrid contract could be primarily written in natural language, and include just one or two terms written in code. In addition, the same contractual term(s) can be written in both natural language and in code. The natural language terms.

```
    currencyCode: contract.unitPrice.currencyCode
  };
  enforce isBefore(now(),contract.dueDate)
  else
                          return PriceCalculation{
      shipment : request.shipment,
      totalPrice : zeroMoney,
      discount : zeroMoney,
      late : true
    };

  // Guard against missing temperature readings
  let readings : SensorReading[] = request.shipment.sensorReadings ?? [];
  enforce readings != []
  else throw ErgoErrorResponse{ message : "No temperature readings received"};

  // Calculates payout
  let payOut = contract.unitPrice.doubleValue * integerToDouble(request.unitCount);

  // Calculates discount, if any
  let discount =
   calculateTempdiscount(contract.minTemperature,
                 contract.maxTemperature,
                 contract.discountFactor,
                 readings)
  + calculateHumdiscount(contract.minHumidity,
                 contract.maxHumidity,
                 contract.discountFactor,
                 readings);

  // Returns a price calculation, applying any discounts
  let totaldiscount = MonetaryAmount{
   doubleValue: discount * integerToDouble(request.unitCount),
   currencyCode: contract.unitPrice.currencyCode
  };
  let totalPrice = MonetaryAmount{
   doubleValue: max([payOut - totaldiscount.doubleValue, 0.0]),
   currencyCode: contract.unitPrice.currencyCode
  };
  emit PaymentObligation{
                          contract: contract,
                          promisor: some(contract.importer),
                          promisee: some(contract.grower),
                          deadline: none,
                          amount: totalPrice,
                          description: contract.importer.partyId ++ " should pay shipment amount to "
++ contract.grower.partyId
                };
  return PriceCalculation{
   shipment : request.shipment,
   totalPrice : totalPrice,
   discount : totaldiscount,
   late : false
  }
 }
}
```

(Source: Smart legal contracts Advice to Government, UK, 2021). Against this background, it is now possible to argue that a uniform legal language can play a decisive role for coordinating law and innovation for two main reasons. First, smart legal contracts can be used to advance cross-border activities. Thus, a uniform legal language will concur to reinforce markets' fluidity. Second, the jurist, as interpreter dealing with a *lingua franca*, will more aptly coordinate and thus reconcile the terms of (smart) legal contracts combining words, symbols and code. While smart legal contracts' conditional logic structure is in line with today's acceleration and efficiency, some doubts concerning the protection of fundamental rights remain as per the above-mentioned example of the debtor. Moreover, the absence of international private law regulatory framework supports these claims due the a-territorial nature of smart legal contracts[67].

As a matter of fact, the location-based principles, such as *lex rei sitae*, which have long guided international private law, struggle to adapt to the contemporary digital landscape. Legal scholars and practitioners face substantial difficulties in ascertaining where the *location* of a transaction resides when servers, data, and digital assets are spread across the globe.

This dispersion complicates the assignment of a singular location to international transactions, as data may traverse various servers, datacentres, and even national boundaries. The notion of a transaction's physical location, so pivotal to *lex rei sitae*, becomes increasingly elusive.

This long-standing principle in international private law, dictates that the law governing a transaction is determined by the location where the subject matter of the transaction is physically situated. This principle has been invaluable in resolving disputes involving immovable property. However, it encounters formidable challenges when applied to transactions reliant on dispersed servers. The traditional approach may no longer provide the clarity and predictability it once did.[68]

In sum, a *lingua franca* may appear as a requirement to give consistency to legal narratives of the past in a future perspective. Overall, it aims at restoring justice when it comes to smart legal contracts, law, automation, and ultimately human agency. The thrust behind this assumption lies in the disputed matter of legal interpretation. From that standpoint, 'the key to this issue lies in interpretation's dualistic nature, i.e. that it has both a backward-looking conserving aspect and a forwardlooking creative one. This dualism would seem to indicate that in interpreting the law, judges both seek to capture and be faithful to the content of the law as it currently exists, and to supplement, modify, or bring out something new in the law, in the course of reasoning from the con-

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[67] Guillaume [36].

[68] Anand and Bambauer [3].

tent of the law to a decision in a particular case'[69]. In such a case, constraints[70] pertaining to the sphere of natural language and therefore extending to the sphere of legal register can be reasonably accommodated along with the multi-layered[71] nature of forms of language.[72] To continue, a uniform legal language can fulfil through simplification Brachman's principles of instantiation, individuation and

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Footnote 69 (continued)

[69] Dickson [22]. Stanford.

To continue interpretation can be summarised as follows. 'Interpreting—according to all the uses and possible adaptations of the term—is generating a message, which fulfils one of the following functions: a descriptive (or cognitive: information is conveyed that enriches the knowledge possessed by the recipient); an expressive function (such as conveying feelings, as in the performance of plays and musical works or in literary and artistic explication); a prescriptive function (in which communication is aimed at establishing a ought-to-be and directing behaviour) In all these cases, the term 'meaning' indicates the final message, the way the referent is understood. This is clear when a description is at stake, or when interpreting a precept aimed at regulating relations in society. But even the concert performer, in his own way, grasps a meaning in the score in front of him; he understands it and makes it understood. The same twofold operation is performed by the director of a drama'.

Brutti [10].

[70] 'Language, too, can be seen as a hierarchy of constraints, from the species-wide constraints on all humans (and perhaps birds and whales, too), to the particular constraints that make me sound like me—and work out of my memory, shape as I shape, relate to others as I do, and live in my world with some kind of coherence. One can study this continuum at any level, but language is not reducible to just one level. … I/ we are interested in language in full context—real language—we must take care not to exclude the individual voice, which is the only place where self-correction, i.e. change, happens—where the living organism interacts with the environment'.

Johnstone [40].

[71] Levels In his review of lessons learned in semantic nets, Brachman [9] identified five distinct groups of primitive types used in these languages. He considered each of these groups to stand for a particular viewpoint, or conceptual 'level'. Any network, he argued, can be "analysed in terms of any of the levels" (p. 27). In other words, a concept expressed in a language at one level, can be understood and expressed at all other levels as well. On the other hand, an interpreter usually commits to support only one of these sets. At the implementational level, semantic nets are mere graphs, data structures where links are pointers and nodes are destinations for links. The logical level emerged in reaction to criticism that semantic nets did not have formal semantics. It perceives semantic nets as a convenient depiction of predicates or propositions (the nodes) and the logical relationships between them (the links). Originally, however, semantic nets were meant to capture the meaning of word concepts. At this conceptual level, links are case relations between nodes representing word senses. Here, the primitives are less neutral, and encompass conceptual elements and relations, such as action types and cases (thematic roles) respectively. Not always are these primitives explicitly defined as part of the semantic net language, but on the whole the relations do have this flavour. One level higher, nodes and links are language dependent. Linguistic level networks are composed of arbitrary relations and nodes that exist in a domain. Each consecutive level adds a commitment to a particular interpretation of the structure of the world'.
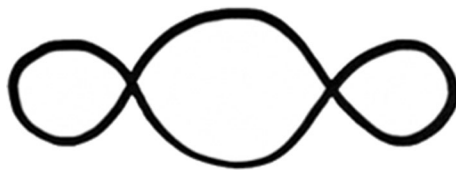
Hoekstra, R. Ontology Representation: Design Patterns and Ontologies that Make Sense, IOS Press, Incorporated, 2009.

[72] Also including code.

denotation.[73] Therefore, the act of legal interpretation can also be regarded as an act of communication by means of the creation of a message.[74]

As a consequence, it can concur to establish the basis for the re-qualification of existing legal ontologies.[75] In turn, they can be understood as '*agreements* about shared conceptualisations. Shared conceptualisations include conceptual frameworks for modelling domain knowledge; content-specific protocols for communication among inter-operating agents; and agreements about the representation of particular domain theories'.[76]

A visual conceptual equivalent of this proposed method can be Pistoletto's *Third Paradise*. This artwork does clearly depict and explain the tension among these instances, wherein legal interpretation can establish balance.

Hence, legal interpretation based on a standard legal language will contribute to grant recognition (in the Hegelian sense of *Anerkennung*[77]) to concrete situations and players within blockchain networks as well as in the infosphere. Additionally, this process can overcome some possible representational barriers arising out of the separation between the *meaning* and the *sense* of an object as noted by Frege.[78]

In other words, this framework represents a tool with which to enforce substantial equality given the multi-layered feature of language.[79] From one hand, this

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[73] Brachman [9].

[74] Aptly, Betti resolved interpreting into understanding: that is, into the appropriation of experience by individual consciousness. Betti [6].

[75] As of Gadamer's Truth and Method [28], ontologies can be understood through hermeneutics. Gadamer [28].

[76] Gruber, T. R. Towards principles for the design of ontologies used for knowledge sharing. In Guarino, Nicola, and Poli, Roberto (eds.), *Formal Ontology in Conceptual Analysis and Knowledge Representation*. Kluwer Academic Publishers, Deventer, The Netherlands, 1993.
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[77] Siep [61].

[78] 'Frege raises the question of whether identity is "a relation between objects or between the names or signs of objects?" (Frege 1952: 56). He argues that since a relation of identity of an object to itself would be of no interest, the relation must be between the names or signs for objects. But, Frege states, a name has two relations to its object: one, the "meaning", is the direct designation of (or reference to) the object, the other, the "sense", is the "mode of presentation" of the object.
Geach and Black [30].
Cf. also Lundquist Lita and Jarvella (2000).

[79] «Language, too, can be seen as a hierarchy of constraints, from the species-wide constraints on all humans (and perhaps birds and whales, too), to the particular constraints that make me sound like me—and work out of my memory, shape as I shape, relate to others as I do, and live in my world with some kind of coherence. One can study this continuum at any level, but language is not reducible to just one level. … I/ we are interested in language in full context—real language—we must take care not to

framework would first constitute a conceptual basis to restore a contemporary version of the *scientia iuris* capable of systemising—and yet not blurring—legal traditions. On the other hand, it might also temper the rigour of algorithmic determinism produced by software's conditional logic.

For that reason, this theory can contribute to provide a methodological mean to overcome legal particularisms and/or lack of regulation at domestic and international level[80].

Once more, the below adaptation of the *Third Paradise* illustrates this possible balance. Arguing with the Theory of Games, this suggested approach can be also seen as a Pareto improvement enabling the convergence of traditional law (yellow) and *Lex Cryptographia*[81] (blue) into the realm of *recognition* in the centre.

Building with De Saussure and Law and the Art, the resort to a shared legal language would bridge thorny issues of legal transplant[82] and facilitate the convergence of alphabetic and binary languages. From the one hand, this technique can ease the harmonisation between existing bodies of law and future forms of regulation, similarly to Roman praetorian law[83]. On the other hand, it would create the margin for introducing an equity-based legal reasoning[84] in line with natural law principles. As a result, it would also concur to frame new patterns of legal validity[85]. From this perspective, the form of semantic integration descending from Pistoletto's artwork fulfils Gadamerian *Horizontenverschmelzung* (i.e. fusion of horizons) as the merging between legal language and blockchain dimension yields an entirely new meaningful situation.[86] Along these lines, interpretation acts as ascription of meaning

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Footnote 79 (continued)

exclude the individual voice, which is the only place where self-correction, i.e. change, happens—where the living organism interacts with the environment». Johnstone [40].

[80] Cf. note 36.

[81] Reference has been made to Wright and De Filippi, note 29.

[82] Watson [64].

[83] Papinian defined praetorian law as follows: '*Ius praetorium est, quod praetores introduxerunt adiuvandi vel supplendi vel corrigendi iuris civilis gratia propter utilitatem publicam* (= praetorian law is the right which the praetors have introduced in order to advance or supplement or correct the *ius civile* for the sake of the public interest) (D.1.1.7.1.)'.

[84] Cf. the two examples above. For a punctual exam of equity with reference to the classic tradition cf. *Corpus Iuris Canonici*, C.25, q.1, c.25 and C.25, q.2, c.21.

[85] In a nutshell, «Legal validity governs the enforceability of law, and the standard of legal validity enhances or restricts the ability of the political ruler to enforce his will through legal coercion». In Internet Encyclopaedia of Philosophy, https://iep.utm.edu/legal-va/. (last accessed on 25th April 2023).

[86] Gadamer [28].

enabling the fitting of blockchain technology into the model (i.e. set of requirements) of the law[87],[88].

Practically, a standard legal language would first accommodate (1), (2), and (3).

In sum, this method may also represent an adaptation of Kelsen's *Grundnorm*[89]. Firstly, it tackles the challenges of our epoch. Secondly, it can concur to establish a consensus ad idem given that (smart) contracts are forms of private governance.[90] In this perspective, this outlined use of a standard legal language can be understood as

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[87] As per [47], p.4, 'an entity is intelligent if it has an adequate model of the world (including the intellectual world of mathematics, understanding of its own goals and other mental processes), if it is clever enough to answer a wide variety of questions on the basis of this model, if it can get additional information from the external world when required, and can perform such tasks in the external world as its goals demand and its physical abilities permit'.

McCarthy and Hayes [47].

[88] For instance, the existence of a uniform legal language can support the proper implementation of the reasoning below expressed in form of code to establish jurisdiction, competence, applicable law, and substantive law in the context of a specific legal case in Italy. The example is taken from Dung and Sartor [24].

decision(Case;Court;Outcome): This statement signifies a decision being made in a legal case. It includes three components: the case in question (Case), the court where the decision is rendered (Court), and the outcome of the decision (Outcome).

call(jurisdMod(italy) + Case; hasJurisdiction(italy)): This call statement checks whether Italy has jurisdiction over the case. It utilizes a module called "jurisdMod(italy)" and evaluates whether Italy "has jurisdiction" over the specific case. If this condition is met, it likely results in a decision favoring jurisdiction.

call(compMod(italy) + Case; hasCompetence(Court)): Similarly, this call statement assesses whether Italy has competence in the court where the case is being heard. It uses a module called "compMod(italy)" and checks whether the court "has competence." If satisfied, it may lead to a decision affirming competence.

call(applLawMod(italy) + Case; applicableLaw(Country)): Here, the code examines whether Italian law is applicable to the case. It utilizes a module "applLawMod(italy)" and determines if Italian law is the "applicable law" for the specific case.

call(substantiveLawMod(Country) + Case;Outcome): This statement evaluates the substantive law of the relevant country (possibly Italy) in relation to the case and derives an outcome based on that law.

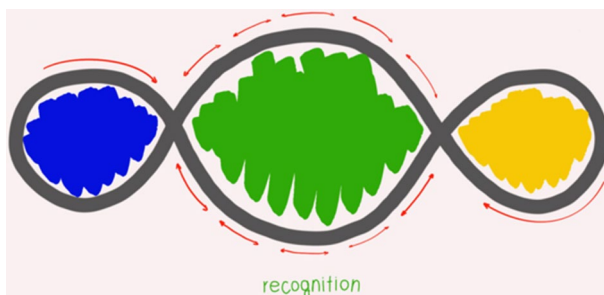[89] Kelsen [42].

[90] Rutgers and Sauter [58].

To continue, this intended outcome would bring the collective dimension back into the contractual and legal theory. More thoroughly, 'In both contract and tort, rights and obligations are to some extent shaped by the deliberate actions of the parties. Both contract and tort, however, also involve the application of community standards that are 'collective in origin'. Both contract and tort are concerned with what people do, as well as what they intend. Both draw heavily on the notion of reasonableness. Lord Steyn has observed that reasonableness in contract law 'postulates community values', is 'concerned with contemporary standards' and is evidenced by 'usages and practices of dealings' in the relevant field'.

Cf. Robertson [57].

In this respect, it should be remarked what follows. 'A community may extend well beyond private households and small groups to include an eclectic mix of representatives of public interest organisations, of business firms and of private citizens. The public character of these communities and the political nature of their interactions justify characterising them as new forms of polity, often not bound to specific territories, focused on a relatively narrow set of issues, and integrated as much through cross-cutting ties as by means of new information technologies'.

Cf. Appelbaum et al. [4].

a requirement or an underlying basis over which to establish a renewed global legal system[91].[92]

recognition

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91 In this sense, Pettit's caveat reveals all its cogency: 'if language is not correct, then what is said is not what is meant; if what is said is not what is meant, then what must be done remains undone; if this remains undone, morals and art will deteriorate; if justice goes astray, the people will stand about in helpless confusion. Hence there must be no arbitrariness in what is said. This matters above everything'.

92 Even in a functionalist understanding of the law whereby '"Rights" are not things. They are ways of explaining results' Mason [49].

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Authors and Affiliations

Pierangelo Blandino[1]

✉ 　Pierangelo Blandino
　　pblandin@ulapland.fi

[1]　Law, Technology and Design Thinking Research Group, University of Lapland – School of Law, Yliopistonkatu 8, 96300 Rovaniemi, Finland