

# Smart Contracts, Blockchain and Land Registry

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## 1.- Introduction.

First of all, I want to express my gratitude to ELRA for giving me the chance to share some reflections about the interactions between smart contracts, distributed ledger technologies, specially blockchain, and Land Registries.

I think that I have the duty to advise that this is a speech from a *law and economics* approach, not from a technological one, from which I would have nothing to say.

Once made this advise, I can start.

The *World Economic Forum* of Davos has calified blockchain as *megatrend*. This idea is generally accepted.

Indeed, *the European Parliament resolution of 3 October 2018 on distributed ledger technologies and blockchains: building trust with disintermediation (2017/2772(RSP) (48)*:

*“....calls on the Commission to explore the improvement of traditional public services, including inter alia the digitalisation and decentralisation of public registries, land registry, licensing, citizen certification (e.g. birth or marriage certificates) and migration management, in particular by the development of concrete use -cases and pilots; calls on the Commission also to explore DLT applications that improve processes related to the privacy and confidentiality of data exchanges, as well as access to e-government services using a decentralised digital identity”.*

In this same and main stream of opinion some authors think that blockchain is a revolution comparable to appearance and development of personal computers or to development and popularization of internet<sup>1</sup>.

However, not all opinions about blockchain are so enthusiasts. Roubini, for example, says<sup>2</sup>:

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<sup>1</sup> See Tapscott D. and Rapscott A., *Blockchain Revolution*, Penguin, N.Y, 2016, p-16

*“Blockchain has been heralded as a potential panacea for everything from poverty and famine to cancer. In fact, it is the most overhyped – and least useful – technology in human history”.*

Whatever the case maybe, I will focus this speech on the potential interactions between blockchain technology and Land Registries. For these interactions work, the so-called smart contracts would be needed. This is why the title of this speech is “Smart Contracts, Blockchain and Land Registry”-

## **2.- The main opportunities and challenges of new information and communication technology from the perspective of Real Estate Registration Systems.**

### **2.1.-Introduction**

Amid the Digital Revolution, and from the perspective of big data<sup>3</sup>, Land Registries are very valuable databases. Those data are valuable for the development of algorithms. Therefore, large multinational companies want to access them and to obtain the largest possible profit.

Said that, in this speech, I will refer to some opportunities and challenges of the so-called smart contracts, as well as the blockchain technology offer in relation to the Land Registries, as we know them.

When assessing these issues, we need to consider that, among economists, there is a tendency to believe that the biggest possible degree of automation should be pursued in any economic activity, as it will bring a productivity increase.

And within the institutional sphere and, more precisely, the sphere of property rights on Real Estate, this presumption seems to loom over the role of the Registry.

This is why is mandatory to start becoming clear that Registration Systems are, indeed, databases, but that is not their main trait. As we will see, they are public systems for the production of a unique kind of data, specially in the case of the title registration systems, a data that only the State can provide: the so called *in rem* entitlements. This is why Registries and, specially, Title Registries use a very sophisticated, legal and institutional , technologies or, if you prefer, architecture.

We can observe that the expectation about these challenges and opportunities is due to the belief that Registration Systems are particularly appropriate for automation, and, therefore, for blockchain technology.

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<sup>2</sup> Roubini N. <https://www.project-syndicate.org/commentary/blockchain-big-lie-by-nouriel-roubini-2018-10>, visited November 16, 2018

<sup>3</sup> See Mayer-Schonberger V. And Cukier K.,Big Data: A Revolution That Will Transform How We Live, Work and Think, UK, 2013.

Why? Because there is the implicit assumption that Land Registries are mere post-box offices; that is, nothing but data recipients with the only mission to publish them as quickly and accurately as possible.

This is why it should be made clear that a Registration System is not mainly a database or an electronic mailbox, but an institutional technology, which, in first place, produces *in rem* entitlements - in the case of Registries of Rights-, and, in second place, it allows to know its content to any person with legal interest for it.

For the production of entitlements *in rem*, Registries, specially Title Registries, are a part of the legal transfer systems.

That implies that the Land Registry performs the role of a kind of *gatekeeper*<sup>4</sup>, that is, the role of verifying the legal compliance of conveyance processes, the role of *guardian* of registration entries that prove the ownership and encumbrances, the role of *to give protection* to entitlements and, the role of *to give information* to any person with legal interest but protecting personal data, as well as the role of *underwriter*, that is, the role of purveyor of indemnity in case of mistake. Without those notes, registration systems would not play the role of *purveyor* of reliable inputs in the judiciary, and therefore, transactional, sphere.

Through this way, Land Registries save information and transaction costs to economic agents and contribute to the efficiency of the markets.

This is why Land Registries entitlements are simultaneously secure and transferable with agility, making assets more valuable and liquids, in the context of impersonal exchange, as happens in a market-based economy.<sup>5</sup>

## **2.2.- Now, we need to have a glance to the current situation of the blockchain technology applied to the Land Registry.**

I find appropriate, before going deep in this topic, to note that, despite the intense promotional efforts made by the industry around this technology, as well as those made by certain Registration Agencies, to this day no country has fully implemented a *Land Registry Blockchain*, that is, one which plays the role that the Land Registry currently plays

We observe that the different national Land Registry Blockchain Projects only affect the conveyance stage, but not the one that takes place at the Registry. The *blockchain* technology is only used to store documents and back up the entries.

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<sup>4</sup> Thomas R.:” A land registration system, especially one which offers indefeasibility, is not a straightforward data-processing system, based on *nemo dat* principles. The Registrar is the gatekeeper granting definitive legal rights.” *The New Zealand Experience: The risks and implications of automation*, paper submitted to the Conference that took place in Auckland, New Zealand, 29-31 August 2018, p.23

<sup>5</sup> See Méndez González F. P, *Fundamentación económica del derecho de propiedad privada e ingeniería jurídica del intercambio impersonal*. Ed.: Thomson Reuters, 2011.

This is why the use of expression *Land Registry Blockchain* in those projects causes confusion.

This is why should be commended the rigor shown by the report about the pilot project developed in Cook County, where Chicago is located. It concludes that blockchain may be suitable for private transactions and submitting documents to the Registry, but only if the current legal framework is preserved.

It states that “the *only official registry is that of the County*”<sup>6</sup>, which is quite far from the aspirations of the proponents of peer to peer solutions which reject the intervention of independent third parties. It is worth mentioning that Cook County has a Deed Registry or Registry of Documents.

Lastly, during the second annual conference of the International *Blockchain Real Estate Asociation (IBREA)*, held in Nueva York in 2017, it was concluded that *blockchain* tends to substitute the role of the notary, although it was acknowledged that, in nowadays, blockchain cannot ascertain the identity or capacity of the parties to a transaction.

With regards to the Land Registry, it was acknowledged that in Nations with a Land Registry able of publishing online entitlements and encumbrances, there is a very narrow opportunity for a *Land Registry Blockchain*.

Projects in this field, therefore, are mostly focused on States that lack a Registry, or on those where Registry is inefficient. Considering that 70% of the land in third world countries is unregistered, that’s where the business opportunities clearly lie.<sup>7</sup>

This is, in a very summarized manner, the current scenario of the blockchain technology in relation to the Land Registry.

The next issue we should look into is whether said technology may be able, in the foreseeable future, to take on the role the State, and therefore the role of the Land Registry plays in the allocation of *erga omnes* entitlements of property rights.

### **3.-Foreseeable evolution of this scenario. Reference to some of its main questions.**

#### **3.1.- Identity and capacity of parties**

Nevertheless, to predict the future evolution of blockchain applied to the Land Registry is not an easy task. I will focus the analysis mostly on its impact on the

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<sup>6</sup> Cook County Recorder of Deeds, Blockchain Pilot Program Final Report 32-34 (2017), <http://cookrecorder.com/wp-content/uploads/2016/11/Final-Report-CCRD-Blockchain-Pilot-Program-for-web.pdf>

<sup>7</sup> Molina Balaguer F., *Informe correspondiente a la Segunda Conferencia Anual de Ibreá -International Blockchain Real Estate Association-* Nueva York, 10 de octubre de 2017. *Paper* citado con autorización del autor.

title registration systems, with a brief final reference to deed systems.

First of all, in order to blockchain can serve as a system of production of entitlements *in rem* is necessary that is able to ascertain the identity and capacity of the parties to a transaction, but it is not the case. Blockchain connects supposed *avatars*, not persons behind them, and, however, that is the preferred feature for partisans of this technology.

If the parties have to reveal their identity and, for fiscal or other reasons, they are forced to do so, this would imply the intervention of third parties, usually public authorities.

It breaks the most defining trait of this technology: being a *peer to peer* system, without the intervention of intermediaries, either public or private. The *self-sufficiency* of the system is the *raison d'être* of the blockchain technology, at least in the mind of their inventors

### **3.2.-The principle of freedom of contractual form. The blockchain as the only and mandatory way.**

In second place, in order to blockchain can produce *in rem* entitlements, legislation should reject the principle of *freedom of form*, with blockchain emerging as the only and compulsory system within the jurisdiction that adopts it, refusing validity and efficacy to any other forms of contracts or conveyance systems.

Certainly, instead, we could choose the conservation of freedom of contractual form and freedom of procedure of transfer, but giving more probatory force to blockchain entries in relation to out blockchain transactions. In this case, the blockchain entries should win by a legal norm, not by the self-sufficiency of blockchain technology.

This in turn would complicate cross-border transactions considerably, unless the various nations adopt a blockchain governed by the same rules, which in itself would imply a regulated blockchain subject to the States, and far from what proponents advocates for.

### **3.3.-Special reference to self-executing contracts –smart contracts-. Related issues.**

#### **3.3.1.- Consensus needs self-executing contracts are public**

In third place, blockchain would need *smart contracts*, so called by N. Szabo<sup>8</sup>. I think we should refer to them as *automatic or self-executing contracts*. This pose, in principle, two kinds of issues:

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<sup>8</sup> Szabo, Nick, *Smart Contract: Building Blocks for Digital Markets*, 1996, [http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart\\_contracts\\_2.html](http://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_2.html) (last acces, November, 26, 2018).

In first place, contracts with a property transfer finality should be public for its efficacy *erga omnes*, something that citizens and economic agents would hardly accept.

It could be argued that such problem could be avoided by establishing a permission access to these contracts. Nevertheless, this solution poses a serious problem.

If *consensus* is part of the essence of this technology, such *consensus* could not be achieved if not all individuals are a node and if not all nodes can access to the contracts, because, in those cases, they could not know contracts and, therefore, they could not oppose neither to contract nor to transfer that violates their entitlements. Therefore, in case of a blockchain with permission access transactions only could entail permissioned people but it could not have *erga omnes* effects.

Related to the first problem, it is necessary to be conscious that inefficacy of contracts affects the efficacy of the transfer, even in abstract systems. Certainly, it only affects whereas the transferred asset is not transferred to a third party, because the *tradens* meanwhile preserves a *condictio*. The *condictio* is an *actio in personam* that allows to recover the transferred asset meanwhile it remains in hands of the buyer.

Certainly, someone could say that this limit could be surmountable by introducing totally abstract transfer systems.

However, we find the opposite trend is prevalent, even in areas under the Torrens system, where reforms usually evolve from immediate to deferred indefeasibility. Even in New Zealand, although since 2017 immediate indefeasibility has been maintained, considering the number of exceptions introduced, it would appear that deferred indefeasibility has been covertly adopted, and, precisely, the reason behind this legislative evolution is the growth of identity fraud.

This is why it would be surprising to confer validity to blockchain transfers disconnected from their causal contracts. It should be added that in Germany, where the doctrine of abstract transfer is followed, abstraction does not operate *inter partes*, and many authors defend that abstract system should be abandoned.<sup>9</sup>

### **3.3.2.- Real scope of self-execution. The need of resorting to oracles.**

The second issue that we find when analyzing self-executing contracts are those related to the real scope of the self-compliance of the self-executing contracts required for blockchain can operate as producer of an *in rem* entitlements system.

The first problem is that those contracts are drafted in *machine code*, a different language of human languages.

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<sup>9</sup> Méndez González F.P., La función de la fe pública registral en la transmisión de bienes inmuebles. Un estudio del sistema español con referencia al sistema alemán., Ed.: Tirant Lo Blanch, 2017.

This feature poses, in a first place, the problem of the necessary *understandability* to give a valid consent, linked to the validity of the contract itself.

As Feliu Rey<sup>10</sup> maintains, in a self-executing contract the expression of an agreement must be made using a programming language.

Therefore, it is appropriate to question how the comprehension of the clauses and the emission of a conscious consent are ensured. And, in case of transcription, we should solve who should be responsible in case of mistake and, as well as, to specify the effects, at least related to third persons, of a transfer based in a contract mistakenly transcribed.

These issues become more complicated when these kinds of contracts are, in addition, standardized and presented to multiple recipients. Furthermore, when one of the parties is a consumer, the rules of protection of consumers against abusive clauses will apply.

Indeed, in contrast with human language, which is often nuanced and ambiguous, machine code does not allow for that.

Decisions are structured in conditional instructions: if A then B, if C then D. This implies that, currently, given the present state of this technology, it will not be possible to code any obligation into a smart contract, due to the inherent limitations of machine code to describe an obligation,<sup>11</sup>.

I invite you consider expressions such as “*good faith*”, “*diligent merchant*”, “*good pater familias*”, “*rebus sic stantibus*”, “*change of business fundamental basis*”, “*act of god*”, “*unforeseeable facts or foreseeable though inevitable*” etc...

### **3.3.3.- The *tradeoff* between self-compliance and contractual complexity.**

This would explain why the so called smart contracts and *blockchain* are gaining traction, particularly, in the sphere of derivatives, which, considering their

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<sup>10</sup> Feliu Rey J. “Smart Contract: Concepto, ecosistema y principales cuestiones de Derecho privado”, *La Ley Mercantil*, no 47, 2018, pag. 18

<sup>11</sup> De Filippi P and Wright A. *Blockchain and the Law*, Harvard University Press, 2018, pág.77. Feliu Rey J. “Smart Contract: Concepto, ecosistema y principales cuestiones de Derecho privado”, *La Ley Mercantil*, no 47, 2018, pag. 8 ss. Surden H. “Computable Contracts”, *U. C. Davis L. Rev.*, vol. 46, 2012, pp. 633 and ss., “(...) *contemporary computer algorithms cannot read or understand even basic written language texts anywhere near the sophistication exhibited by a person of ordinary literacy*”.

high level of standardization, have actually become legal commodities<sup>12</sup> .

In the real estate sphere, however, things work out in a different way. In this realm, it exists a *trade off* between the value of the entitlements and the complexity of the transactions, and for that reason smart contracts and blockchain thrive more easily in the realm of low value transactions. <sup>13</sup>.

In addition, in the real estate realm, may coexist many types of property rights simultaneously. Often the obligations have to be complied along longer periods of time or subject to a condition that is a future and uncertain event, something that cannot be verified automatically.

With all that, we must assume that a progressive advance in artificial intelligence will allow more complex self-executing transactions.

Guessing today that the limit will be for the complexity of transactions is neither easy nor feasible, but relational contracts like the ones in the real estate sphere will be hardly self-accomplished.

### **3.3.4.-The need of intervention of a third party**

If real estate contracts are not self-executable, then it is necessary that a third party does cooperate.

This is why the cooperation of third parties will be required in a wide range of scenarios.

That breaks the principle of *self-sufficiency* of blockchain and, furthermore, that shows the absence of an institutional architecture inside blockchain that foresees the intervention of a third party in case of conflict. This absence is logic because blockchain is itself the negation of the need of an institutional technology in case of conflict.

Therefore, if *the code is law*, then we do not need any law. If the technology is self-sufficient, secure, honest and reliable, it does impede conflicts, and, therefore, it does substitute the law and, finally, the State by the technology.

This is a key issue, because blockchain does not bring a new technology. It brings a combination of existent technologies, aligning the various concurrent interests, making they become, allegedly, convergent.

However, that is not the case. To prove this point I will focus on the, probably, two of the main incidents occurred so far.

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<sup>12</sup> Arruñada B., *Blockchains Struggle to Deliver Impersonal Exchange*, Minn. J.L. SCI & Tech., Vol.19.1, 1918, pág.78. Also, CAPGEMINI CONSULTING, *Smart Contracts in Financial Services: Getting from Hype to Reality*

<sup>13</sup> Arruñada B., *Blockchains Struggle to Deliver Impersonal Exchange*, Minn. J.L. SCI & Tech., Vol.19.1, 1918, pág.78



#### **3.3.4.1.- The *Decentralized Autonomous Organization* – DAO- incident.**

This incident happened in 2016 on the *Ethereum* platform considered the pinnacle of smart contracts, based on the principle *code is law*. That means that the smart contracts, on its own, are completely self-executing contracts and they are not subjected to any rules set forth by third parties, either private or public, even the State. However, things, in reality, happen in a way quite different, as evidenced this incident.

After a fraud affected a chain of transactions, the management of the platform decided to execute a *hard fork*, that is, a software modification to roll back the preceding transactions deemed invalid.

This implied the negation of the immutability, of the self-compliance of the transactions, and, therefore, of the “*code is law*” principle. That fact evidenced the existence of a Central Authority that nobody elected, that had not any legal authority at all, and who has an undeniable power that used to its own profit.

Despite of it, after that, the founder of Ethereum, Vitalik Buterin, was called “*benevolent dictator for life*”<sup>14</sup>. This caused a rift inside the community which gave birth to a new crypto-currency, supposedly true to the essence of the system, called *Ethereum Classic* (ETC), although only to a certain point, as it admits, in case of fraud, resorting to the Courts of Justice.

#### **3.3.4.2.-The Bitcoin Crash**

A similar event happened in 2017 inside bitcoin community about the size of blocks. The bitcoin protocol established a relatively small size for to avoid attacks of rejection of service. This decision complicates the speed of data processing of bitcoin blockchain, lower than the speed data processing of the main financial operators.

Facing this situation, from one side, miners and companies around bitcoin demanded bigger blocks because they are more profitable for them, and, from the other side, main developers of the *code* oppose for security reasons. As a consequence, it arose a civil war and a solution *hard fork* was adopted, in the same way than in the case of ethereum incident, above mentioned.

These events show the lack of blockchain technology and, therefore, the need of an institutional one to avoid, in case of conflict, this kind of abuses of the controlling platforms.

As we know, only the State could ultimately protect the interests of citizens and, therefore, also their interests as users. And, in this realm, the Land Registry is a tool of the State to protect the interest of owners and acquirers.

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<sup>14</sup> Roubini N. <https://www.project-syndicate.org/commentary/blockchain-big-lie-by-nouriel-roubini-2018-10>, visited November 18, 2018

**4.-Blockchain is not an automatic but an automated system that needs the cooperation of third parties for its current functioning. That means that blockchain is not a *peer to peer* transaction system.**

As we have seen, when blockchain runs with smart contracts, the intervention of third parties will be required in a wide range of scenarios. In a meaningful number of cases these third parties are humans. Probably, in the foreseeable future, they will continue being humans.

As well as, we need to be aware that blockchain technology needs, for its ordinary functioning, the so-called miners. This is why blockchain is not an *automatic* but an *automated* system.

In the case of Land Registries we distinguish between Automatic and Automated Land Registries.<sup>15</sup>

A Land Registry is *automatic*, when the registration processes triggered by an application for registration, are conducted without any intervention from a Registry Authority.

A Land Registry is *automated*, when the registration procedures are conducted electronically, but it involves the necessary intervention of the Registry Authorities in order to produce any changes in the Registry Records or, in general, in the different stages and aspects of the Registration Procedure – like making an entry or issuing a certificate, for instance-.

Blockchain involves the necessary intervention of the so-called miners. One of the main functions of miners is ordering the blocks through finding a solution to a mathematical problem that consists in the calculation of a *hash*. Therefore, blockchain is not an *automatic* but an *automated* system.

Miner who is the first solving this problem gains and is rewarded in bitcoins. Indeed, miners do not only get paid in bitcoins for solving those mathematical problems, but they also earn money in commissions from the contractual parties. Although paying fees is not compulsory to confirm transactions, they are compulsory in order to speed up the validation of transactions of users and, through this way to gain the blockchain entitlement.

Today, to pay commissions for contractual validations it is not mandatory. Only it is mandatory to pay commissions for speeding up those validations. However, when the system of rewards for the calculation of a hash finishes, to collect commissions for speeding up validations will be the only source of revenues for miners, and, as it is foreseeable, those commissions will be more expensive<sup>16</sup>. In fact, between the main reasons that motivated M. Hearn to abandon the bitcoin

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<sup>15</sup> See Brennan G. *The Impact of e-Conveyancing on Title Registration. A Risk Assessment.*, Ed. Springer, 2015, pág. 29.

<sup>16</sup> Gallego Fernández L. A, Cadenas de Bloques y Registros de Derechos, in *Revista Critica de Derecho Inmobiliario*, nº 765, pág. 120

community were the lack of transparency of commissions and the foreseeable increase in the future and the lack of democracy in the bitcoin community, that is to say, the lack of control of blockchain by their users<sup>17</sup>.

At this point, we need to bear in mind that the incentive structure for miners fosters evil behaviors, because the incentives of different stakeholders are not aligned. In fact, the root of problem of above mentioned bitcoin *crash* was, on one hand, the conflicting interest between, miners interested in a bigger size of blocks for increasing their revenues and, on other hand, developers of the *code*, interested in a not so big size for security reasons, and, finally, companies around blockchain with interest mainly, but no only, aligned with miners.

Something similar happened in the ethereum realm. By design, every operation processed by the Ethereum Virtual Machine is executed by every active node on the ethereum network. In order to prevent abuses, the ethereum protocol charges a small fee –referred to as “gas”- for each computational step. In order to avoid excessive price fluctuations, the price of gas is not fixed but dynamically adjusted by miners based on the market price of ether<sup>18</sup>. Because the bitcoin blockchain can only store a limited amount of information per transaction, and the ethereum blockchain charges for each computational step in a smart contract program, it is often prohibitively expensive to build decentralized applications that rely in a blockchain for file storage<sup>19</sup>

It is necessary to call attention to the fact that blockchain needs intermediaries –although they are not the State but private citizens or companies- means that is not a peer to peer system, perhaps it more emphasized feature.

#### **4.- At this point we should consider whether the set formed by smart contracts and blockchain are suitable for taking on the role of the Land Registry .**

##### **4.1.-Basic concepts.**

Although there are several types of Land Registries, as we know, I will focus on the Title Registries (Registries of Rights), with a final reference to Deed Registries (Registries of Documents).

In order to properly answer this question, we must remember a series of basic concepts:

1.- Contracts only produce effects *inter partes* and, therefore, they are only useful for governing the relationships between A and B, but not the relationships with C and ,in general, with third parties or, better, between third parties –*inter*

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<sup>17</sup> See <https://blockstream.com/technology/#sidechains> .

<sup>18</sup> De Filippi P. and Wright A. *Blockchain and the Law*, Harvard University Press, 2018, pág.29

<sup>19</sup> De Filippi P. and Wright A. *Blockchain and the Law*, Harvard University Press, 2018, pág.30

*tertios*-.

2.- Entitlements *in rem* are more valuable than entitlements *in personam* because entitlements *in rem* impede that a third party may have any influence regarding the entitlement and the rights content, because this kind of entitlements are protected by a “property rule” not by a “liability rule”.<sup>20</sup>

3.- *In rem* entitlements over real estate may only be acquired by *usucapio* or by means of an acquisitive system based on a Title Registry. A contract is not sufficient, and, therefore, neither a self-executing contract it is, for acquiring an entitlement *in rem*. A contract only is sufficient for acquiring an entitlement *in personam*, that is to say, an entitlement only protected by a liability rule, with effects only *inter partes*.

#### **4.2.-Can blockchain produce similar effects to those of paragraph 892 of the German BGB or article 34 of the Spanish Ley Hipotecaria?.**

Taking into account these basic concepts, I will analyze whether blockchain could produce indefeasibility, that is, similar effects to those of paragraph 892 of the German BGB or article 34 of the Spanish Ley Hipotecaria.

I will forego the need of a procedure of first registration in the blockchain network, the regulation of contracts operating outside such network related to real estate property rights on the ledger, etc.. Instead, I will focus on the issue of whether, hypothetically, contracts for transferring ownership contained in the ledger could potentially produce similar effects to those acknowledged to the Registry entries in a Registry of Rights, without the intervention of any trusted third parties.

In order to deal with this topic, we must analyze it, even if briefly, in each stage of registration procedure.

1.-During the formative stage of the contract or conveyance, there is the problem linked to blockchain’s inability not only for identifying the *verus dominus* but also for identifying the parties of the contract, as well as their capacity and their powers of disposition. These lacks have as consequence that blockchain can not ensure that valid consent has been given, especially if we consider that self-executing contracts –smart contracts- are drafted in *machine code* and not in *human language*.

The overcoming of this lack needs the use of oracles<sup>21</sup>, which implies a

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<sup>20</sup> Calabresi G. y Melamed D. A., *Property Rules, Liability Rules and Inalienability: One View of The Cathedral*, published in 1972 by Harvard Law Review. There is a version published by *Economic Foundations of Property Law*. Ed.: Little, Brown and Company, págs. 31-49. *Grosso modo*, such distinction, from a law and economics perspective, is equivalent to Roman Law distinction between *actio in rem* y *actio in personam*. If a right is protected by a property rule, it can not be altered without its owner will. If a right is protected by a liability rule, it can be altered, but paying an indemnity to its owner. See too Méndez González F.P., *Derechos reales y titularidades reales*, Revista Crítica de Derecho Inmobiliario, núm. 736.

<sup>21</sup> Feliu Rey J. According to this author, oracles are sources of external information that provide data to a smart contract. In this way, smart contracts can specify duties or be accomplished. Feliu

breach of the *principle of self-sufficiency* of blockchain. In this stage of the procedure, it does not seem that blockchain can take on the role currently reserved to notaries, solicitors and, in general, conveyancers.

2.-Contracts regarding real estate are not usually short or simple. They usually are relational<sup>22</sup>, that is, composed by obligations which should be implemented, after the signature of the contract, during a period of time of varying length. For this reason, they are hardly standardizable and self-executable. For instance, during the life of a sale with deferred payment, long-time mortgages etc, the circumstances may vary entering into play the clause of *rebus sic stantibus*.

The compliance of the contract, its novation and its resolution should be decided by an oracle as well. Such oracle usually would be the judiciary authority.

3.- The role of the Registration Authority related to the control of legality of contracts and transfers inside the registration procedure, that is to say, for registration, has a different scope in different countries, even in countries with titles registration systems.

For instance, in Spain there is a causal system of transfer entitlements on property rights on unmovables, as well as there is a *numerus apertus* system of property rights and , finally, there is a title registration system.

This conjunction of features explains why, in Spain, the scope of legality control of the Registrar inside registration procedure is large.

However, in Germany, with a title registration system, but with a more or less abstract system of transfer and a *numerus clausus* of property rights system, the scope of legality control of the *Rechtflieger* is not the same.

Regarding the function of Registrar in a Torrens System –which involves a Registry of Rights- Thomas R. states.:

*” What is not often readily comprehended is the policing function undertaken by the Registrar.*

*A land registration system, especially one which offers indefeasibility, is not a straightforward data-processing system, based on nemo dat principles. The Registrar is the gatekeeper granting definitive legal rights.*

*The Registrar has the function of ensuring that only dealings that are correct as a matter of law, supported by due authorisation, are accepted for registration”.*<sup>23</sup>

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Rey J. *Smart Contract: concepto, ecosistema y principales cuestiones de Derecho privado*”, *La Ley Mercantil*, no 47, 2018. Related to the question about who can be oracles that provide that kind of information, they could be the Civil Register, The Police, solicitors, conveyancers, etc

<sup>22</sup> See, Williamson, O, E., *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting* (1985)

<sup>23</sup> Thomas R., *” The New Zealand Experience: The risks and implications of automation*, paper submitted to the Conference that took place in Auckland, New Zealand, 29-31 August 2018, p.23

In every country Registrars have higher or lower legality control faculties depending on the traits of their contracts and transfer system, as well as the kind of Registration System, which is a part of the whole system of acquisition.

The Spanish Registrar checks, inside the registration procedure, whether the contract is valid from the perspective of the contract law and as well as the compliance with public law rules –fiscal, environmental, urban planning, anti money laundering, etc.-

This kind of role is necessary for the legal certainty, and, if we have into account the traits of the system mentioned before, it could only be played by a qualified and institutionally neutral oracle, such as actually is the Registrar, at least in the current and foreseeable stage of development of artificial intelligence. The serious institutional shortcomings shown by bitcoin and ethereum support this view.

Neither parties nor their representatives are able of self-containment. This is why they can not take decisions that entail a third person.<sup>24</sup>

#### **5.- Can the so-called *rule of consensus* of the blockchain eliminate the need for the legal oversight of the Registration Authority?.**

In the performance of their roles, Registrars represent the interests of third parties absent from the transaction. Jerónimo González, a distinguished spanish jurist, said in 1928 the Registrar is “*the attorney defense of interest of absent third parties*”.

If, by definition, every transaction in a blockchain system is public and immutable, then we should guess that there are not absent third parties that could be affected by those transactions, at least in the sense that all people knows or can know such transactions. Therefore, if a third party considers that the contract violates their rights, we should guess he or she can oppose it.

Therefore, perhaps, in this new technological environment there is no need for anyone protecting their interests.

Is that so?. In my opinion, the answer is a negative answer and, in order to support this point of view, I will offer the following arguments.

#### **5.1.-Regarding the meaning of term *consensus* in the blockchain ecosystem.**

1.- The first issue to consider is the meaning of the term *consensus* in the

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<sup>24</sup> See Méndez González F.P, Estado, Propiedad, Mercado, en Revista Critica de Derecho Inmobiliario, nº 708, 2008. Thomas R., *The New Zealand Experience: The risks and implications of automation*, paper submittef to the Conference that toke place in Auckland, New Zealand, 29-31 Augusto 2018, specially pages 23 ,24 ss.

*blockchain ecosystem* because it may produce confusion.

This term *-consensus-* suggests that the conveyance process managed in a blockchain protocol ensures that exists the consent, both explicit or implicit, from all potential –parties and thirds- stakeholders. Nevertheless, this is not the case.

First, because as I explained, blockchain cannot identify parties of a contract.

Secondly, because when we use the term *consensus* inside *blockchain ecosystem* it refers to the coincidence or agreement regarding very limited checks.

Indeed, the term *consensus* only refers to validation of each transaction conducted by the rest of the nodes in the network, but this validation is limited. Blockchain only checks (1) that the transferring account exists and has a sufficient balance for the transaction, (2) the coincidence of signatures, (3) the existence of the receiving account. And that is all.

The check does not cover essential elements of the contract, which may cause its nullity such as, for example, the identity of the transferor -whether the person ordering the transaction was indeed owner of the account-, or whether the consent for the transaction was freely given, or if the payment or other details of the transaction were legal or legitimate, all details which will determine the validity and/or efficacy of the conveyance act or contract.

In the case of *ethereum*, as in the case of *bitcoin*, the check is limited to verify that the supposed *avatars* –not the persons behind them- have signed a contract, and, then, the rest of nodes had checked the validity of the signatures; that the consents required by the smart contract have been given by every supposed avatar –not individual behind them- whose consent is needed for the validity of transaction; whether the foreseen events have taken place or not, and that the consequences foreseen for each scenario have been complied with.

That is all that blockchain consensus covers.

Furthermore, if we are buying a real state, blockchain is not sufficient, by itself, to ensure neither the existence of the real estate, nor the accuracy of its boundaries. In order to achieve that, blockchain needs to resort to oracles.

## **5.2.- The alleged consensus in case of double selling and fork choice solution.**

Nevertheless, it is usual to say that in case of *double spending*, the *blockchain* protocol resolves it through the so called *consensus*.

Double spending can be a suitable expression if we refer to bitcoin double transaction with different persons. In case that the double transaction is not of a crypto-money but of a thing that exists out of the network – for example, a house-, I think could be better use expressions as *double selling*, *double transfer* or *double transaction* to refer it. In any case, I will analyze whether is true that in the case of *double selling* blockchain protocol resolves through *consensus*.

This term *-consensus-* suggests that the conveyance process managed in a blockchain protocol ensures that exists the consent, both explicit or implicit, from all potential stakeholders, but actually that is just not the case<sup>25</sup>.

Firstly, because as I above explained, blockchain cannot ascertain the identity of parties of a contract. Furthermore, blockchain partisans consider the fact that it allows to conceal the actual identity of contractual parties, as one of the main advantages of the blockchain, because it allows to conduct transactions circumventing any legal limitation.

Secondly, because when we use the term *consensus* inside *blockchain ecosystem* it refers to the coincidence or agreement regarding very limited checks.

In effect, it is a common place to state that blockchain is a *distributed* and *public* system, without, allegedly, intermediaries. In this situation and bearing in mind the general design of the system, transactions are progressively communicated from one node to another, but the protocol cannot ensure that the order in which a node receives a transaction is the same order in which the transactions were sent.

*Due to differences in propagation time in the network, there will be nodes which will receive the second transaction earlier than the first one – and they will consider the latter as invalid –and viceversa- resulting in a lack of agreement as to which transaction is valid* <sup>26</sup>.

The adopted solution in case of *double selling* is that the chain splits into two different branches.

The rule to establish which transaction prevails is the so-called *fork choice*, in accordance to which, in case of bifurcation, the miners will always have to choose the longest branch; that is to say, the one with greater number of confirmed blocks, measured in terms of the *computational power* required to validate them.

The transaction included in this branch will be the prevailing one, even if it is dated later.<sup>27</sup> That implies that transactions included in blocks integrated in the shorter branches which were confirmed, stop being confirmed.

It is usual to say that this rule preserves the *consensus* across the network because what the majority agrees is presumed valid. Furthermore, it is assumed that those who control most of the computational power in the network will act in

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<sup>25</sup>It is not the case, but someone could understand that if we are using blockchain, it implies we are accepting all their consequences-. However, we can not guess it because: 1.- When someone uses blockchain thinks will not fail. It is more, the main added value of this technology precisely is to avoid that this kind of frauds can happen. 2.- If, in order to substitute current systems of transfer, blockchain is the only transfer system, agents can not choose.

<sup>26</sup> Gallego Fernández L. A, Cadenas de Bloques y Registros de Derechos, en Revista Critica de Derecho Inmobiliario, nº 765, pág. 123

<sup>27</sup> Véase Filippi P y Wright A. Blockchain and the Law, Harvard University Press, 2018, pág.24



accordance with the protocol<sup>28</sup>.

### **5.3.-The fork choice does not mean consensus but defencelessness**

It is necessary to call attention to this solution means that the owner of certain amount of crypto-coin or asset lacks mechanisms, supplied by the protocol itself, to oppose the unlawful use of such coins or assets by an unauthorized third party.

This fact, in conjunction with the anonymity and irreversibility of transactions, once validated and incorporated to a block, leaves such owner *defencelessness*, because owners or acquirers may lose their acquisitions, without being able to avoid it, even though they observe a diligent behavior.

It causes rejection to call *consensus* to a rule where A acquires from the owner according to the blockchain protocol; therefore, the acquisition is confirmed by the very protocol, and despite all that, finally A loses the acquired asset, even though not having incurred in any negligence. Furthermore, without a chance to do anything in order to impede it, unless A pay a higher fee to miners and, so, they dedicate more computational power in order to solve the mathematical problem which validates the block where the transaction is to be included, and in that manner, his or her acquisition prevails.

This problem becomes more serious if we consider the above mentioned solution given to the *DAO* and *Bitcoin Crash* incidents, where the controllers of the networks adopted solutions favorable to their interests against the blockchain protocol.

These incidents made evident that blockchain can fail, and that when it fails it lacks an adequate institutional design to solve this failures, that is to say: it lacks institutional design for it, and this simply is not acceptable. As Roubini says

*“The truth is that the developers have absolute power to act as judge and jury. When something goes wrong (...) they simply change the code and “fork” a failing coin into another one by arbitrary fiat, revealing the entire “trustless” enterprise to have been untrustworthy from the start.”*<sup>29</sup>

These facts clearly show blockchain simply cannot be the instrument to solve this kind of problems. It only serves to put transactions in a sequential order. In order to solve those kind of problems, a different rule is needed, as well as the intervention of an impartial third party, being this function one of the usual roles of the Land Registrars and Judges.

### **6.-The preference for trusting third parties to protect the legal integrity of our rights**

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<sup>28</sup> *Ibidem*.

<sup>29</sup> Roubini N. <https://www.project-syndicate.org/commentary/blockchain-big-lie-by-nouriel-roubini-2018-10>, visited November 18, 2018

We have take into account that individual freedom has a price in terms of personal responsibility which not everyone is prepared to pay it. As Arruñada says:

*"..... aware of their own shortcomings, they usually trust more and rely on centralized solutions, based on private and public agents of custody. This preference in trusting third parties more than themselves imposes a particularly grave restriction to the applications to the sphere of real estate property, as the universal nature of such property requires that the same rules apply to all individuals with entitlements over each asset. In a hypothetical, fully decentralized, proprietorship system, everyone would be granting or denying our consent to all transactions which may affect our property rights. As a consequence we would turn into the only custodians not only of our cryptographic keys (to receive notifications and give our consent) but also to protect the legal integrity of our rights"*<sup>30</sup>

I would add to this quote that not everyone is willing to assume this responsibility because it is not easy to uphold the legal integrity of our rights and, also, because contracts can violate not only our *in rem* entitlements, but also specific rights of unidentified individuals, that is, specific rights of individuals as a members of the society<sup>31</sup> and, even, public assets.

This means that contracts may violate the rights of unidentified third parties whom are protected by imperative and prohibitive rules frequently unknown by the citizens, specially those citizens who are not comfortable with the law.

In addition, we must take into account that self-protection requires a permanent attention to each blockchain transaction, which would require an amount of time that citizens do not have.

In fact, the solution proposed by blockchain is equivalent to say –in the realm of Land Registries–:(1) If Land Registries are public, then any transaction registered without opposition of any registered proprietor is valid and effective, (2) In case of *double selling* does not prevail the first acquirer that registers his or her acquisition, or the second one if is innocent but is the first in registration. Who prevails is the acquirer with the majority of votes of registered proprietors, even against de consent of the affected registered owner.

It does not seem that a solution of this kind would be legally acceptable, because results from circumstances that totally escape from the acquirers control.

Finally, in an increasingly specialized world, legal overseers also need to be specialized.

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<sup>30</sup> Arruñada B., *Blockchains Struggle to Deliver Impersonal Exchange*, Minn. J.L. SCI & Tech., Vol.19.1, 1918, pág.92

<sup>31</sup> For example, if the urban planing prohibits to build houses in an area, people, that is , each individual of that society, has the right to request a authorities in order to impede to anyone builds a house and sells it. Blockchain is unable in order to impede it. It needs oracles for that.

## 7.- Self-executing contracts -smart contracts-, -blockchain- and Registries of Documents.

In a first approach, it would seem that the impact of blockchain in this kind of registries would be greater than in relation to the Registries of Rights. In this sense, Arruñada maintains that<sup>32</sup>:

*"...it is conceivable that a registry of deeds may be replaced by an automatic system for dating private contracts and preserving its contents, if parties to those contracts cannot modify or tamper with both functions after signing them".*

Indeed it is conceivable, but, currently, it does not seem achievable. Theoretically, the contents of contracts digitally formed within the blockchain protocol can not be manipulated, but if the transferor made a simultaneous or immediately posterior sale in favor of a third party, a serious problem would arise.

Actually, the legal solution to this conflict is that the document that first gains access to the Registry is the one that prevails.

However as Gallego L. says:

*"If the protocol used in blockchain was to be applied to the Land Registry, in case of a successive submission of documents regarding the same asset, the submitters would not be able to know the rank or priority their rights will be registered with, potentially being the document submitted in the last place being registered with precedence over the one that was submitted in the first place, and this for a simple random fact- the mining of the block- or economic -the last submitter paid a higher fee and obtained an earlier inclusion in the block, and it could be even worse if an initially registered right is subsequently unregistered for being included in a short branch."<sup>33</sup>*

This implies that the legal certainty principle is not possible in the blockchain protocol. As I have above written, it does not seem that a solution of this kind would be legally acceptable, because results from circumstances that escape from the acquirers control.

Furthermore, at this point, we need to bear in mind that the incentive structure for miners fosters evil behaviors, because the incentives of different stakeholders are not aligned, despite that the partisans of the blockchain protocol assume the contrary.

Indeed, as I have above mentioned, miners do not only get paid in bitcoins for solving mathematical problems, they also earn money in commissions from the

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<sup>32</sup> Arruñada B., *Blockchains Struggle to Deliver Impersonal Exchange*, Minn. J.L. SCI & Tech., Vol.19.1, 1918, pág.16

<sup>33</sup> Gallego Fernández L.A., *Cadenas de bloques y registros de derechos*, op. cit, pag.130.

parties. Although paying fees is not compulsory to confirm transactions, they are compulsory in order to gain the abovementioned priority<sup>34</sup>,

Those kind of solutions to the problem of the double dispositions in the blockchain protocol could be avoided by resorting to an oracle which would decide that only the first transaction is admitted.

And it would be logical to assume that the person in the best disposition to act as an oracle would be someone independent and qualified, ensuring neutrality, and those are precisely the features of the Land Registrar considering the nature of its role.

Reaching this solution, however, would demonstrate that blockchain, with a fork choice rule, should not replace a Registry of documents to assign priority ranks. As it could not either in a Registry of Rights regarding this part of its function

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## **8.- Conclusions.**

Bitcoin and Blockchain arose in the libertarian environment as tools in order to free from central Banks and States and to permit individuals functioning with their own currency. Later, blockchain, in conjunction with the smart contracts arose as a technology for secure transactions guaranteed by these technologies instead by the State. As we have seen, thinks are quite different.

Blockchain is not a peer to peer transaction system because needs third parties intervention, like miners, and, if working with the so called smart contracts, needs oracles for a large range of scenarios. Certainly, from a libertarian point of view, if these third parties are privates instead the State, then they are not thirds, but this is only a dangerous fantasy in order to preserve our entitlements.

Blockchain –both in bitcoin and in ethereum protocols- does not forego the need of intermediaries. It needs them. In fact, blockchain does substitute some intermediaries for others. More specifically, blockchain aims to substitute the State for private intermediaries with the argument of technological honesty and infallibility.

Blockchain is not a free service. To use blockchain has a price.

In the case of bitcoin, it is usual to point out that its cost and commissions are lower than those of Banks. This is true today because miners earn their money finding the hash of the block, but, in the future, they only will earn money by commissions. This is why commissions, probably, increase. In fact M. Hearn foresaw

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<sup>34</sup> Gallego Fernández L.A., Cadenas de bloques y registros de derechos, op. cit. pág.120

their quick increase in the future<sup>35</sup>

In the case of the blockchain of ethereum protocol, which runs with smart contracts, it needs, as well as, oracles in a large range of scenarios, as we have seen. Services of those oracles are not free and we do not have any reason to guess that will imply lowers costs than institutional systems.

Blockchain is not an autonomous, decentralized and indelible system as the Dao and Bitcoin Crash incidents, above mentioned, shown us. As I above written, those facts evidenced the existence of Central Authorities that nobody elected, that had not any legal authority at all, and who has an undeniable power that used to its own profit. These Central Authorities demonstrate to have enough power to delete and change the allegedly indelible contents of the blocks.

Those central authorities are private are interested authorities. Their decisions do not entail the State. They want the *code is law* principle instead the subjection the code to the law. Experience shows that code only is subjected to their will.

However, if we allow that blockchain is not necessarily a libertarian and selfsufficient technology and we accept that could be a technology organized and managed by thirds, specially by the State, in this case, blockchain can perform a supporting function to immovables secure transaction sytems, for example, to storing documents , back up the entries or notifications.

At the same time, the progress of artificial intelligence will allow the development of more complex smart contracts, and the usefulness of these technologies will be larger. Nowadays, we can not determine which could be the scope of this usefulness.

In any case, blockchain is a technology and as such technology opens new possibilities, allows to make new things, but it does not say which things we should make with. In other words, technologies are tools of power and, therefore, they obbey to the power's logic: the trend to accumulation and the use of it for exclusive benefit of the power holder.

This is why technologies must to be counterbalanced by the institutional technology as tool to enforcement.

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<sup>35</sup> See <https://blog.plan99.net/the-resolution-of-the-bitcoin-experiment-dabb30201f7#.ewfepr21j>

