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*Public Administration and the Challenge of Contractual Automation. Notes on Smart Contracts**

Giovanni Gallone
(Magistrate at T.A.R. Lecce, PhD L.U.M. University)

ABSTRACT **Contracts represent the most advanced and least explored frontier of public sector digitisation policies. Smart contracts, totally or partially self-executive contracts operating in the blockchain ecosystem, already widely used in the private sector, received, in Italy, at the beginning of 2019, regulatory coverage, ensure high standards of efficiency and allow to contain the phenomena of maladministration. Contractual automation is close, on the legal level, to the provisional one, but it preserves some irreducible peculiarities as well as specific limits, such as the tendential incompleteness of the negotiation regulations, which can, however, be remedied by exploiting the most recent innovations in the field of artificial intelligence.**

1. *A new frontier for the digitisation of administrative action*

In recent decades, the efforts of the Italian legislator have focused almost exclusively on the digitization of administrative activities of authoritative kind[1]. The proceeding and the administrative decision[2] have represented the main testing field of new technologies, stimulating the reflection of the doctrine on issues ranging from invalidity to simplification[3], through the strengthening of participative guarantees offered by electronic forms[4].

The contract remained on the edges of juridical scene[5].

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[1] In general about the digitization policies carried out in Italy: M. L. Maddalena, *La digitalizzazione della vita dell'amministrazione e del processo*, in *Foro amministrativo*, 10, 2016, 2535, D. Marongiu, *Mutamenti dell'amministrazione digitale. Riflessioni a posteriori. Scritti in ricordo di Luis Ortega*, in *Diritto amministrativo e innovazione*, 2016, 29, G. Piperata, *Semplificazione e digitalizzazione nelle recenti politiche di riforma della Pubblica Amministrazione italiana*, in *L'amministrazione che cambia. Fonti, regole e percorsi di una nuova stagione di riforme*, F. Mastragostino, C. Tubertini and G. Piperata (eds.), Bologna, Bononia University Press, 2016, 255.
For an overwiev of the Spanish panorama: J. Valero Torrijos, *De la digitalización a la innovación tecnológica: valoración jurídica del proceso de modernización de las administraciones públicas españolas en la última década (2004-2014)*, in *Revista de Internet, Derecho y Pólitica*, 19, 2014, 117 e M. Fernández Salmerón, *La reforma del régimen jurídico de las administraciones públicas y del procedimiento administrativo en España*, in *Diritto mercato e tecnologia*, 2016, 2, 207. In France, which also seems to share the Italian approach due to the closeness of legal traditions, see J. B. Auby, *Le droit administratif face aux défis du numérique*, in *Actualité juridicque droit administratif*, 2018, 835. For an influential voice from Germany, M. Martini, *Tranformation der Verwaltung durch Digitalisierung*, in *Verwaltungspraxis und Verwaltungswissenschaft*, 2018, 11 and A. Windoffer, *Herausforderungen der Digitalisierung aus der Perspektive der öffentlichen Verwaltung*, in *Digitalisierung im Spannungsfed von Politik, Wirtschaft, Wissenschaft und Recht,* 2018, 363.
In the countries of common law the debate on digitization has taken on different connotations, less strictly juridical, and has often crossed paths with that of new public management. On the decline of the new public management in the perspective of *E-change* - in the sense of its definitive overcoming P. Dunleavy, *New Public Management is Dead – Long Live Digital – Era Governance*, in *Journal of Public Administration Research and Theory*, 2005; in response it has been more cautiously observed by others that "New public management is in trouble, but is not really dead" (J. De Vries, *OECD Journal on Budgeting*, 1, 2010, 88-91).

[2] A cautious approach is evident in the work of pioneers of the sector such as G. Duni, *L'utilizzabilità delle tecniche elettroniche nell'emanazione degli atti e nei procedimenti amministrativi. Spunto per una teoria dell'atto amministrativo emanato nella forma elettronica*, in *Rivista dell'amministrazione*, 1978, 407, B. Selleri, *Gli atti amministrativi «in forma elettronica»*, in *Diritto e società*, 1982, 133 e V. Masucci, *L'atto amministrativo elettronico. Primi lineamenti di una ricostruzione*, Napoli, Jovene, 1989, G. Duni, *Amministrazione digitale*, in *Enciclopedia del diritto, Annali*, I, Milano, Giuffrè, 2007, 14, according to which "parlare di amministrazione digitale pone l'accento sulla forma dell'attività ed in particolare degli atti".

[3] See A.G. Orofino, *La semplificazione digitale*, in *Diritto dell'economia*, 2019, 87, I. Martìn Delgado, *La gestión electronica del procedimiento administrativo*, Fundación Democracia y Gobierno Local, 2009, 84 and C. Cimerco Seira, *La administración electrónica al servicio de la semplificación administrativa: luces y sombras*, in *Revista Aragonesa de Administración Pública*, 38, 2011, 155.

[4] A.G. Orofino, *Forme elettroniche e procedimenti amministrativi*, Bari, Cacucci, 2008. See, for the iberian experience, the considerations made by M. Almeida Cerreda and L. Miguez Macho, *Breve contextualización del estudio del nuevo régimen jurídico del funcionamento por medios electrónicos del sector público y e la tramitación informática del procedimiento administrativo común*, in *La Actualización de la Administración Electrónica*, II ed., M. Almeida Cerreda and L. Miguez Macho (eds.), Santiago de Compostela, Andavira, 2018, 17. In France: J. Sauret, *Efficacité de l'adminstration et service à l'administré: les enjeux de l'administration électronique*, in *Revue française d'aministration publique*, 110, 2014.

[5] A reluctance that is probably the result of an ancestral distrust, today only partially overcome, of the public administration towards the contractual instrument, and that G. Berti, *Il principio contrattuale nell'attività amministrativa,* in *Scritti in onore di Massimo Severo*

Nevertheless, it presents itself as a crucial juncture, in which the critical issues and opportunities for the public decisor are more evident[6].

The contract, intended as an instrument of administration[7], defines the final structure of the administrative relationship.

Furthermore, it is precisely during the negotiation phase that maladministration phenomena occur more frequently[8].

This is due, first of all, to the deformalisation which characterises the private law activity of the administration with a mitigation of the guarantees, controls and limits inherent in the public statute.

This diversity of approach to digitisation becomes even more evident in those forms, such as public evidence, which combine authoritative and negotiating moment by inextricably engaging them.

In contrast to an increasingly marked computerization of the selection procedure, there is a contractual phase that remains declined in traditional terms, without any openness to new technologies. This constitutes, from a theoretical point of view, the projection of dualistic theses that preach a clear break between the previous administrative phase and the following negotiation phase[9].

A legally unified reading of the phenomenon of public evidence[10] would, instead, require a radical change of perspective on the subject.

If the contract is nothing more than a different and additional juncture, compared to the procedural one, of the administrative relationship, it is necessary to rethink the very concept of digital procurement[11]. It should be intended widely, not only as the digitisation of the administrative procedure, between the announcement and the award of the tender, but also as the digitisation of the contract that follows it.

From this point of view an opportunity for reflection is, today, offered by the disruptive technology of distributed registers (the so-called blockchain[12]) and the new achievements in the field of artificial intelligence[13]. In fact, it is

Giannini, Milano, 1988, 49, linked to the rejection of the "idea che le cose interessanti lo Stato fossero trattabili come ogni altro oggetto o interesse, e che si dovesse, invece, ripiegare su forme e vocaboli o concetti che meglio rispondessero alla progressiva sacralizzazione del potere statale".

[6] Especially in the modern "pan-contractualism" of the globalized world in which there is the expansion of the contract, to the detriment of the law, in sectors and areas distant from those proper to consent with a progressive departure from the traditional requirement of the patrimoniality of the relationships that it is called to regulate (cfr. F. Galgano, *La categoria del contratto alle soglie del terzo millennio*, in *Contratto e impresa*, 2000, 919).

[7] V. Cerulli Irelli, *Il negozio come strumento di azione amministrativa*, in *Autorità e consenso nell'attività amministrativa – Atti del XLVII Convegno di studi di scienza dell'amministrazione*, Varenna, Villa Monastero 20-22 september 2001.

[8] These are considerations that have already been more organically set out in G. Gallone, *Blockchain, procedimenti amministrativi e prevenzione della corruzione*, in *Diritto dell'economia,* 3, 2019.

[9] Was in favor of a marked distinction between the two moments, understood as autonomous legal seriations (the thesis of the so-called "*doppiaggio*") M. S. Giannini, *Diritto amministrativo*, Milano, Giuffrè, 1988, II, 363. This approach was the result of a dualistic conception of administrative activity, based on the distinction between public and private law activities (A. Amorth, *Osservazioni sui limiti dell'attività amministrativa di diritto privato*, in *Archivio di diritto pubblico*, 1938, 455, now in *Scritti giuridici*, Milano, 1999, I).

[10] For an attempt to reconstruct in a unified key the phenomenon of public evidence that moves from the teachings of F.G. Scoca, *Attività amministrativa*, in *Enciclopedia del diritto*, VI, Milano, Giuffrè, 2002, I, 95, and the theory of "*atti amministrativi negoziali*" of G. Greco, *I contratti dell'amministrazione tra diritto pubblico e privato*, Milano, Giuffrè, 1986, look at G. Gallone, *Annullamento d'ufficio e sorte del contratto*, Bari, Cacucci, 2016, 145. From this unitary point of view, the *trait d'union* between the phases is to be found in the administrative function, which runs through the administrative relationship, both in its procedural and extra-procedural-contractual declination. (M. Protto, *Il rapporto amministrativo*, Milano, Giuffrè, 2008, 110).

[11] In Spain M. Fernández Salmerón, *Buen gobierno, innovación y contratación pública: Examen crític de algunas técnicas para el fomento de la integridad en los contratos públicos a la luz del Derecho Europeo y de su recepción por la ley 9/127, de 8 noviembre*, in *Transparencia, innovación y buen gobierno en la contratación pública*, R. Martínez Gutiérrez (ed.), Valencia, Tirant lo Blanch, 2018 and I. Gallego Córcoles, *Contratación pública e innovación tecnológica*, in *Revista Española de Derecho Administrativo*, 184, 2017, 193.

[12] It is the most advanced form of distributed computer registry (the so called "distributed ledger"), result of the joint application of already known tools such as digital signature and peer to peer networks. It is a basic technology with multiple applications that makes it possible to overcome the traditional model of centralized institutional trust administration by replacing it, in a disintermediation perspective, with a "trust by computation". In general, about the technology, its origins (with specific regard to crypto-currency and bitcoins) and perspectives M. J. Casey and P. Vigna, *La macchina della verità. La blockchain e il futuro di ogni cosa*, Milano, Franco Angeli, 2018, D. Tapscott and A. Tapscott, *Blockchain revolution: how the technology behind Bitcoin is changing money, business, and the world*, London, Penguin, 2016 and M. Swan, *Blockchain. Blueprint for a New Economy*, Sebastopol, 2015. On the application of blockchain technology in the administrative field M. Atzori, *Blockchain technology and decentralised governance: is the State still necessary?*, in *Journal of Governance and Regulation*, 6(1), 2017, 45-62, S. Davidson, P. D. Filippi and J. Potts, *Disrupting governance: The new institutional economics of distributed ledger technology*, *RMIT University*, 22 luglio 2016 and G. Gallone, *Blockchain, procedimenti amministrativi e prevenzione della corruzione*, in *Diritto dell'economia,* 3, 2019.

[13] The attention to the theme of artificial intelligence appears in spanish and italian doctrine in constant growth: D. Marongiu, *Inteligencia artificial y administración pública*, in *4ª Revolución industrial: impacto de la*

precisely from their combination that the category of smart contracts (so-called "*smart contracts*"[14]) has been given a new lease of life: a category that can represent a very useful tool for administrations in the future.

2. *The Smart Contract. A hint on its legal nature*

If one wanted to offer a first, approximate, notion of smart contract, this could be defined as a contract, totally or partially self-executing, which uses information technology for its implementation. If, therefore, in the traditional contract, the execution of the contract remains entrusted to the will of the parties, who adopt the individual legal acts of execution, in smart contracts the implementation of the contractual relationship takes place in an IT context, through operations that are the result of an algorithm and that, once implemented, go to compose the chain of blocks of a distributed register of the blockchain type.

This is a brand-new figure that induces to reflect, under a different perspective, about the traditional juridical categories[15].

This complex work is certainly facilitated in Italy by the introduction, at the beginning of 2019, of a regulatory definition of smart contract.

The law converting the decree law on simplification[16], after providing the notion of "registro distribuito" ("distributed register"), provides in paragraph 2 of art. 8 *ter* that «si definisce "smart contract" un programma per elaboratore che opera su tecnologie basate su registri distribuiti e la cui esecuzione vincola automaticamente due o più parti sulla base di effetti predefiniti dalle stesse»[17].

To the Italian legislator must be given, therefore, the undoubted merit of having been the first to grasp the potential of the instrument, shifting to the field of positive law reflections hitherto relegated to the plane of theoretical

automatización y la inteligencia artificial en la sociedad y la economia digital, C. García Novoa, D. Santiago Iglesias, M. R. Torres Carlos, A. Garrido Juncal, and J. M. Miranda Boto (eds.), Cizur Menor, Aranzadi Thomson Reuters, 2018, 395, R. Perfetti, *Beyond the chinese room. Appunti per una riflessione su intelligenza artificiale e diritto pubblico*, in *P.A. Persona e Amministrazione. Ricerche Giuridiche sull'Amministrazione e l'Economia*, Urbino, 2017, 1, 457, L. Viola, *Intelligenza artificiale nel procedimento e nel processo amministrativo*, in *Federalismi*, 2018, 2 and S. Vaccari, *Note minime in tema di intelligenza Artificiale e decisioni amministrative*, in *Giustamm*, 2019. In Spain, with specific regard to the protection of the citizen J. Valero Torrijos, *Las garantías jurídicas de la inteligencia artificial en la actividad administrativa desde la perspectiva de la buena administración*, in *Revista Catalana de Dret Públic*, 58, 2019, 82. In France D. Bourcier, *La décision artificielle. Le droit, la machine et l'Humain*, in *Droit et société*, 1996, 32, J.-B. Auby, *Contrôle de la puissance publique et gouvernance par algorithme*, in *Le droit public face au défi technologies de l'information et de la communication, au-delà de la protection des données*, D. U. Galletta and J. Ziller (eds.), Baden-Baden, 2018; B. Barraud, *L'algorithmisation de l'administration*, in *Revue lamy droit de l'immatériel*, 150, 2018, C. Dubois and F. Schoenaers, *Les algorithmes dans le droit : illusions et (r)évolutions*, in *Droit et société*, 2019, 3, 503. In Germany: C. Djeffal, *Künstliche Intelligenz in der öffentlichen Verwaltung*, in *Berichte des NEGZ*, 2018, 1-32.

[14] The introduction of the term "smart contract" dates back to the end of the last century and is due to the reflections of N. Szabo, *Formalizing and securing relationships on public networks*, in *First Monday*, 1997, 9. On the administrative use of smart contracts as a new side effect of artificial intelligence G. Crisci, *Intelligenza artificiale ed etica dell'algoritmo*, in *Foro amministrativo,* 10, 2018, 1787, and G. Gallone, *Blockchain, procedimenti amministrativi e prevenzione della corruzione*, in *Diritto dell'economia,* 3, 2019.

[15] The debate on the nature of smart contracts is quite wide and varied in literature. In Italy it has been almost exclusive prerogative of civil doctrine: P. Cucurru, *Blockchain e automazione contrattuale. Riflessioni sugli smart contract*, in *Nuova giurisprudenza civile commentata,* 2017, 107, G. Finocchiaro, *Il contratto nell'era dell'intelligenza artificiale*, in *Rivista trimestrale di diritto e procedura civile*, 2018, 2, 441, L. Parola, P. Merati and G. Gavotti, *Blockchain e smart contracts: questioni giuridiche aperte*, in *Contratti*, 6, 2018, 681, D. Di Sabato, *Gli smart contracts: robots che gestiscono il rischio contrattuale*, in *Contratto e impresa*, vol. 2, 2017, 378 and M. Giuliano, *La Blockchain e gli smart contracts nell'innovazione del diritto nel terzo millennio*, in *Diritto dell'informazione e dell'informatica*, 6, 2018, 989. Also quite advanced is the debate in Spain: M. Echebarria Saenz, *Contratos electronicos autoejecutables (Smart contract) y pagos con tecnologia blockchain*, in *Revista de Estudios Europeos*, 70, 2017, 69 A. Legerèn – Molina, *Los contratos inteligentes en España. La disciplina del los smart contracts*, in *Revista de Derecho Civil*, vol. 2, 2018, 193–241, J.A. Pérez Bastida, *Smart contracts y función judicial*, in *20 años de la ley de lo contencioso administrativo – Actas del XIV Congreso de la Asociación Española de Profesores de Derecho Administrativo Murcia 8-9 de febrero de 2019*, F. López Ramón and J. Valero Torrijos (eds.), Madrid, 2019, 327 and France: J.M. Bruguière and V. Fauchoux, *Actualités du droit civil du numérique*, in *Revue lamy droit civil*, 162, 2018, 36-41, D. Guegan, *Blockchain publique et contrats intelligents (Smart Contrats). Les possibilités ouvertes par Ethéreum ... et ses limites*, *Documents de Travail du Centre d'Economie de la Sorbonne - Université Paris 1 Panthéon*, 57, 2017. In France see also G. Guerlin, *Considérations sur les smart contracts*, in Dalloz *IP/IT*, 2017, 512, M. Mekki, *Le contrat objet des smart contracts*, in Dalloz IP/IT, 2019, 27. In Germany: T. Hoffman and V. Skwarek, *Blockchain, Smart Contract sund Recht – Smart Contracts als Risiko für Informatiker*, in *Informatik Spektrum*, 2019, 42, 197-204, T. Hoffman, *Smart Contracts and Void Declarations of Intent*, in *Information Systems Engineering in Responsible Information Systems*, C. Cappiello and M. Ruiz (eds.), Heidelberg, Springer, 2019, 168-175.

[16] Decreto legge 14 december 2018, n. 135, converted with amendments with the law 11 February 2019, n. 12 "Conversione in legge del decreto-legge 14 dicembre 2018, n. 135, recante disposizioni urgenti in materia di sostegno e semplificazione per le imprese e per la pubblica amministrazione".

[17] "Smart contract is defined as a computer program that operates on technologies based on distributed registers and whose execution automatically binds two or more parts on the basis of predefined effects of the same".

speculation[18].

But this commendable initiative has its limits. First of all, this definition has an essentially descriptive value and, consequently, a limited heuristic scope. This is due to the fact that the legislator has failed to establish a reference framework.

The legislator's silence is, however, probably to be read as the result of a specific regulatory choice. The idea that underlies it is that of technological neutrality, which permeates the entire system of the Italian Codice dell'amministrazione digitale (Code of Digital Administration)[19]. Such an approach does not make it necessary for the legislator to take a specific position on the *ubi consistam* of the figure, a problem which, although pregnant with implications, remains the prerogative, as we shall see shortly, of doctrinal reflection.

This legal definition of smart contract has, indeed, an eminently operational nature.

It, first of all, takes notice of the wide variety of ways in which the smart contract can operate; ways all united by the fact that the execution of the contract is entrusted to an algorithm.

It is, in fact, the algorithm, upon the occurrence of a specific event entered in the blockchain register (that work as a "trigger point" and which may be represented by the expiry of a term or the occurrence of an event deduced as a condition of termination or suspension) to perform a specific act (execute or suspend its performance, terminate the contract and proceed to liquidate the negotiation relationship).The verification of the trigger can take place either through the acquisition of data *ab externo* (from open sources or otherwise accessible by the program) or *ab interno*, through direct consultation of the distributed register and the data entered by operators.

If the technical modality with which the smart contract operates is clear enough, the problem of its legal nature remains open, because it is out of the focus of the definition.

A first consideration, which should not appear only terminological, is the difference that runs with the electronic contract.

Unlike the latter, where information technology intervenes only in terms of form and, therefore, of the way in which the will of the parties is expressed, in the smart contract, it is the computer that implements the negotiating program[20].

But if the smart contract is a *quid alii* with respect to the mere electronic contract, it is legitimate to wonder whether this does not affect its *ubi consistam*, distancing it from the legal model of private law.

According to a first approach, indeed preferable, rather than a new type of contract it would constitute a specific mode of execution of the will of the parties[21].

Other Authors follow an eclectic approach, arguing that smart contracts can take on, depending on the case, both the nature of contracts or acts of execution of a contract[22].

Whatever approach is followed, the whole doctrine is unanimous in considering that smart contracts, in the absence of special legislation, remain subject to the ordinary law status of the contract[23].

Such a reconstruction seems, today, confirmed, as was said, by the legislator's choice definition. In it, the program remains relegated to the operational plan and does nothing but bring to realization the "effetti predefinti" ("effects

[18] In Spain, in the absence of a specific discipline, the possibility of resorting to intelligent bargaining has been deduced (J.A. Pérez Bastida, *Smart contracts y función judicial*, 332) *a contrario* from art. 11 de la Ley Orgánica 3/2018, del 5 dicembre referred to "*Protección de Datos Personales y garantía de los derechos digitales*" that "da a entender (a contrario sensu) que si existe una cláusula en el contrato donde ambas partes acepten de forma clara, expresa e inequívoca que a consecuencia de un tratamiento automatizado de datos se van a tomar decisiones con efectos jurídicos y/o significativos sobre su esfera patrimonial, la automatización de la relación contractual es conforme a Derecho".

[19] On it, for wider references, A.G. Orofino, *L'esternazione informatica degli atti amministrativi*, in *A 150 anni dall'unificazione amministrativa italiana, Vol. IV - La tecnificazione*, L. Ferrara, D. Sorace, S. Civitarese Matteucci and L. Torchia (eds.), Firenze, Firenze University Press, 2016, 181.

[20] Emphasizes a similar difference M. Giuliano, *La Blockchain e gli smart contracts nell'innovazione del diritto nel terzo millennio*, 1000, that distinguishes smart contract from the "*contratto telematico*" in which "l'uso del computer costituisce mezzo di comunicazione per trasmettere la proposta di un contratto e riceverne l'accettazione" and from the "*contratto cibernetico*" in which "è lo stesso contenuto del contratto ad essere lasciato alle determinazioni del computer". It seems, instead, to superimpose these notions M. Echebarrìa Saenz, *Contratos electronicos autoejecutables (Smart contract) y pagos con tecnologia blockchain*, 70.

[21] A. Legerèn – Molina, *Los contratos inteligentes en España. La disciplina de los smart contracts*, 221, according to who "los requisitos para la conclusión o perfección del contrato contenidos en la ley permanecen invariados, pues lo peculiar reside principalmente en el ámbito de la ejecución de la prestación". Part of the Italian doctrine considers them an operational tool for the negotiation or automatic fulfilment of traditional agreements expressed in digital form: P. Cucurru, *Blockchain ed Automazione Contrattuale. Riflessioni sugli smart contract*, 118.

[22] G. Finocchiaro, *Il contratto nell'era dell'intelligenza artificiale*, 442, M. Giuliano, *La Blockchain e gli smart contracts nell'innovazione del diritto nel terzo millennio*, 1000.

[23] M. Giuliano, *La Blockchain e gli smart contracts nell'innovazione del diritto nel terzo millennio*, 1003.

predefined") by the parties. In substance, the genetic phase of the formation of the contract, does not change; only the execution phase is different; therefore, the applicable discipline cannot be different either, which remains that of art. 1321 of the Italian Civil Code.

There is no distortion of the nature of the contract and this banish the spectre of its complete objectification[24]. The emergence of smart contracts should be seen, rather, as a further stage in the progressive abandon of the 19th century "mystique of consensus", a reflection of the depersonalization of the modern economy of mass production, distribution and consumption.

In this sense, the act of execution is no longer necessarily the result of a specific and precise determination of the party. This does not rule out, however, the need for a subjective imputation of automatic acts of performance of the contract. For this purpose, the will to use the technological instrument, expressed at moment of the stipulation, remains sufficient[25].

The parties, in other words, opting, at the time of conclusion, for the total or partial automation of the contract are bound from that moment to the legal and factual consequences that will follow the activation of the algorithm. The imputation of such effects takes place, therefore, on a voluntary basis, remaining coherent with the traditional model of the contract[26].

3. *Smart contracts and public administration*

At first reading, the regulatory definition introduced in Italy by the decree law on simplification of 2019 does not seem to be primarily designed for application by public administrations. It seems, rather, to be animated by the purpose of giving legal status to figures already widespread in private commercial practice, especially in the so-called fintech sector[27].

This does not exclude, however, that this figure may lend itself easily and profitably to administrative digitisation policies and, in particular, to e-procurement.

In fact, contractual administrative automation has considerable potential.

The advantages that can be derived from its application are of two different orders. On the one hand, they are those offered by the inclusion of the contract in the shared register; on the other, those deriving from automation itself.

First of all, the inclusion in a blockchain type ecosystem ensures the unchangeability of operations and their total traceability.[28]. Every single event in the life of the contract, from the stipulation to its complete implementation, is recorded; the relative data are entered in the shared register, cannot be altered *ex post* and have, thanks to the affixed timestamp, a legally certain date.[29].

This aspect of time certainty has been taken into account by the Italian legislator who, in a statement immediately following the one defining smart contracts, clarified that "*la memorizzazione di un documento informatico attraverso l'uso di tecnologie basate su registri distribuiti produce gli effetti giuridici della validazione temporale elettronica di cui all'articolo41 del regolamento (UE) n. 910/2014 del Parlamento europeo e del Consiglio, del 23 luglio 2014*"[30]. This allows to identify the exact moment of every act of execution of the contract (such as, for example, the withdrawal from the contract or the payment), opposable only against the counterparty but also against third parties.

Such full traceability is accompanied by full transparency of the contract. It also derives from the characteristics of the blockchain ecosystem. The use of the shared register opens, in fact, to the co-detention *ab origine* of each data entered. All participants in the network have a copy of the distributed register on which are recorded not only their own operations but also those carried out by the other nodes.

This realize a system that assure something more than total accessibility: data is, in fact, from

[24] E. Roppo, *Il contratto*, Bologna, Giuffrè, 1982, 267.
[25] F. Bravo, *Contratto cibernetico*, in *Diritto dell'informatica*, 2, 2011, 169.
[26] A theory borrowed in Italy (F. Santoro Passarelli, *Dottrine generali del diritto civile*, Napoli, Jovene, 1986, 125) from the german doctrine (B. Windscheid, *Diritto delle pandette*, Torino, 1930, 202), according to which two distinct "directions of will" are concentrated in the legal transaction: the will of the act and the will aimed at producing the effects.
[27] For its definition P. Schueffel, *Taming the Beast: A scientific Definition of Fintech*, in *Journal of Innovation Management*, 2017, 4, 32.
[28] For a general overview of what is the potential of blockchain technology in its application to the administrative proceedings G. Gallone, *Blockchain, procedimenti amministrativi e prevenzione della corruzione.*
[29] The attribution of a legally certain date follows the affixing to the data block, at the moment of its closure, of a progressive time stamp which identifies it univocally within the sequence in which it is inserted. The unchangeability of the data is, instead, linked to the circumstance that the data, after being validated by all the participants, flows into a register that is not physically located on a single server but on several perfectly synchronized computers. So the modification or alteration of the same by one of the participants would emerge only from the comparison with the matrices held by the others.
[30] Literally in art. 8-*ter* comma 3 del d.l. n. 135 del 2018 "the storage of an electronic document through the use of distributed registry technologies produces the legal effects of electronic time validation as referred to in Article 41 of Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014".

the very first moment in the availability both of the administration and the citizen.[31]. This new and more pregnant declination of transparency have the merit of opening the contractual relationship to the outside world, restoring the desirable unity of the procedural and negotiating phase.[32].

Inserting the contract in a blockchain ecosystem brings, in fact, to a completely new result. It is not only the formal parties to the contract (public administration and contractor) who hold *ab origine* all the data relating to the contractual relationship.[33], but all participants in the network (the so-called "*nodes*") and, therefore, also those who have applied to the procedure without having been awarded the contract[34].

This would enforce the legal prerogatives of the latter as they would have all the information necessary for the exercise of their legal rights[35].

Not to be overlooked, as a further positive effect of this openness of the negotiation phase, is the activation of a "widespread" supervisory mechanism regarding the correctness of compliance, extended to all participants in the public procedure[36].

At the same time, the full mapping of each individual contract case would allow the administration to collect a huge amount of data[37] which could be used, in the context of subsequent entrustment procedures, for the rating of economic operators and the examination of the admissibility of offers made[38].

These last considerations are linked to another aspect on which the use by the administrations of the smart contracts tool can positively affect. It is of immediate intuition, in fact, how the full transparency of the contractual process is accompanied by a reduction of uncertainty in the application of negotiating clauses and, with it, of opportunities for maladministration[39].

[31] These considerations have already been made, in part, in G. Gallone, *Blockchain, procedimenti amministrativi e prevenzione della corruzione.* This avoids the risk of a "bureaucracy of transparency" that now seems to afflict the public administration.

[32] *Supra sub* par. 1.

[33] The introduction of civic access raises new and interesting questions with specific regard to access to documents during the execution phase by economic operators who have not been awarded a contract and, therefore, are not parties to the contract in the formal sense. The jurisprudence has, at least initially, taken a wavering attitude, oscillating between the full practicability, without limits, of the access remedy ex d.lgs. n. 33 of 2013 (T.A.R. Sicilia, Palermo, sec. II, 6 September 2018, n. 1905) and more restrictive positions (T.A.R. Toscana, sec. III, 17 April 2019, n. 577) which distinguish between acts of the administrative phase (in relation to which civic access is exercisable) and acts, information and documents relating to the negotiation phase of execution (for which the only remedy for access remains access *ex* art. 22 of the l. n. 241 of 1990). In doctrine for an updated review L. Minervini, *Accesso agli atti e procedure di affidamento ed esecuzione di contratti pubblici*, in *Foro amministrativo*, 2019, 5, 949. The issue has been resolved, composing a jurisprudential contrast, by Cons. Stato, ad. plen., 2 April 2020, n. 10.

[34] The decentralised database in which the operations carried out are recorded, in an orderly and sequential manner, is, in fact, shared and available to all those who have taken part in the network. It is, therefore, held not only by the successful tenderer but also by the other economic operators who have submitted applications without being usefully placed in the ranking list.

[35] Mechanism now provided for by art. 110 of Legislative Decree no. 50 of 2016 (the Public Contracts Code). The economic operator not usefully classified will have the opportunity to have access to a series of information relating to the execution of the contract to monitor the conduct of the successful tenderer, to report any non-compliance by stimulating the powers of termination of the public party pursuant to art. 108 of Legislative Decree no. 50 of 2016.

[36] On the effects of the transparency assured by electronic means in administrative procedures A. Sánchez García, *Los efectos de la transparencia derivada del empleo de medios electronicos en el comportamiento de los poderes adjudicadores*, in *La reforma de la Administración electrónica: una oportunidad para la innovación desde el Derecho*, I. Martín Delgado (ed.), Madrid, Instituto Nacional de Administración Pública (INAP) 2017, 377.

[37] It is the theme of the use of big data in the adoption of the administrative choices: F. Costantino, *Lampi. Nuove frontiere delle decisioni amministrative tra open e big data*, in *Diritto amministrativo*, 4, 2017, 719. In particular, on the virtuous synergy between blockchain technology and big data E. Karafiloski and A. Mishev, *Blockchain Solutions for Big Data Challenges: a literature review*, in *IEEE EUROCON 2017 – 17th International Conference on Smart Technologies*, 2017, 763-768, K. Rabah, *Convergence of AI, IoT, Big Data and Blockchain: A Review*, in *The Lake Institute Journal*, 2018, vol. 1, 1.

[38] In the Italian experience, the so-called "*company rating*" pursuant to art. 83, paragraph 10, of Legislative Decree No. 50 of 2016 (the Public Contracts Code), is a measure of the reputation of the economic operator, obtained by evaluating its past experience and based on parameters such as the evaluation of performance during execution and continuity in business without dispute. In the same way, the mapping of contractual events could make it easier to ascertain some of the grounds for exclusion from the procedure provided for by art. 80 of the Code (such as, in particular, letter c-*ter* of paragraph 5, which sanctions the case of an economic operator that "abbia dimostrato significative o persistenti carenze nell'esecuzione di un precedente contratto di appalto o di concessione che ne hanno causato la risoluzione per inadempimento ovvero la condanna al risarcimento del danno o altre sanzioni comparabili" – "has demonstrated significant or persistent deficiencies in the performance of a previous contract or concession contract that led to its termination for non-performance or an order for damages or other comparable sanctions").

[39] Corruption represents an endogenous risk linked to the organisational dimension of the administration. It imposes a "self-reflexive" approach: G. Gallone, *La prevenzione amministrativa del rischio-corruzione*, in *Diritto dell'economia*, 2018, 3, and A. Barone, *Governo del territorio e sicurezza sostenibile*, Bari, Cacucci, 2013, 65. More generally on the prevention of corruption in the administrative field in Italy: F. Merloni and L. Vandelli, *La corruzione amministrativa. Cause, prevenzioni e rimedi*, Firenze, Astrid, 2010, B.G. Mattarella, *La prevenzione della corruzione in Italia*, in *Giornale di diritto amministrativo*, 2013, 213. On legislative measures to combat corruption C.E. Gallo, *Legge anticorruzione e funzione amministrativa*, in *Giustamm*, 2013, and G. Piperata, *Contrattazione*

As observed by that part of the doctrine that suport a more exquisitely economic reconstruction of the phenomenon, corruption is an eventuality that is part of the process of negotiation between market operators and that undermines the efficiency of the exchange[40]. Its impact is effectively explained through the use of the agency model (the so-called "agency theory") and, therefore, the subjective split between "principal" and "agent"[41]. The condition of information asymmetry in which the public part is normally paid with respect to the private counterparty turns into the risk of opportunism, both pre and, above all, post-contractual[42]and, therefore, of an intentional deviation of the agent's conduct from the task of protecting the interests of the principal[43].

From this point of view, corruption appears to be the inverse function of the control capacity of the public administration.[44]. Thus, the full transparency of the execution phase allowed by the inclusion of the contract in the shared register, thinning the areas of opacity of the contractual relationship and rebalancing the position of the parties in terms of information, represents the first and main disincentive to maladministration practices.

The peculiar nature, horizontal and widespread, of the control allows, then, to overcome the drawbacks typical of hierarchical or overlapping models, connoted by a subjective concentration of the monitoring function. The control is exercised not only by the public administration, but by all the operators, also private, who participate in the network, thus avoiding the danger of a "capture of the controller"[45].

But the overview of the advantages offered by the use of the smart contracts tool is not limited to those that can be retraced from the inclusion of the contract in the blockchain shared register.

Contractual automation is, in fact, by itself, able to ensure greater efficiency and speed of administrative action[46], reducing the time needed to execute the contract and containing the hypothesis of non-compliance with the obligations arising from it.

On the one hand, in fact, entrusting to an algorithm the implementation of the contract allows to prevent possible inertia of the figures called to intervene in the execution phase (among all that of the director of works[47]). On the other hand, the total or partial predetermination of choices reduces the wide scope of discretion that they have in the exercise of their prerogatives[48]. And the predetermination, total or even only partial, of the negotiating choices of the public party can only be positive in terms of the predictability and calculability of the future of the contractual relationship[49].

It is precisely the theme of predictability that opens up to the more delicate issue of the judicial reflections of automation. It would, in fact, be reductive to believe that the latter is only

pubblica e lotta alla corruzione. Uno sguardo alle recenti riforme amministrative italiane, in *Federalismi*, n. 16/2015.

[40] L. Mundula, *La corruzione: dalle determinanti alle modalità di contrasto*, in *Corruzione e pubblica amministrazione*, M. D'Alberti (ed.), Napoli, Jovene, 2017, 872.

[41] Consolidated scheme in which the first (the principal) delegates, for reasons of necessity or opportunity, to the second (the agent) the exercise of part of his contractual power. For an overview of this theoretical construction K. M. Eisenhardt, *Agency theory: an assessment and review*, in *The Academy of Management Review*, 1989, 57.

[42] In the forms, respectively, of adverse selection and moral hazard. In the field of public contracts, the latter figure is particularly important, having originated in the microeconomic field with specific regard to the insurance sector; see, among all his works, B. Holmström, *Moral Hazard and Observability*, in *Bell Journal of Economics*, 1979, 10.

[43] In this lies precisely the substance of corruption according to M. Monteduro, S. Brunelli and A. Buratti, *La corruzione. Definizione, misurazione ed impatti economici*, Roma, Gangemi, 2013, 11.

[44] L. Mundula, *La corruzione: dalle determinanti alle modalità di contrasto*, in *Corruzione e pubblica amministrazione*, 881, who incorporates the considerations already expressed by S. Rose – Ackerman, *Corruption: greed, culture and the State*, in *The Yale Law Journal*, 120, 2010. Similarly, from the public servant individual perspective, the choice of whether or not to join the *pactum sceleris* is linked to a comparative assessment in which the opportunity cost of committing an illegal act increases in proportion to the probability of being discovered.

[45] J. D. Carrillo, *Corruption in Hierachies*, in *Annales d'économie et de statistique*, 2000, 37.

[46] More generally, on the relationship between administrative performance and digitization, also in a comparative perspective: A. G. Orofino, *La semplificazione digitale* and G. Cattalano, *La décision du contractant au prisme de l'intelligence artificielle*, in *La decisione nel prisma dell'intelligenza artificiale*, E. Calzolaro (ed.), Milano, Cedam, 2020, 77, aspires to "*simplification du jeu des décision pendant l'exécution du contrat"*.

[47] A. Barone and G. Gallone, *La nuova disciplina regolamentare del direttore dei lavori*, in *Il Libro dell'anno del diritto*, Roma, Treccani, 2019, 171.

[48] It is the opinion of R. Couto De Souza, E. M. Luciano and G. Wiedenhoft, *The use of the blockchain smart contracts to reduce the levels of corruption: some preliminary thoughts*, in *Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age*, New York, 2018.

[49] On computability as "contare su ciò che verrà" and as a "fattore costitutivo del capitalismo" N. Irti, *Un diritto incalcolabile*, Torino, Giappichelli, 2016, 5, and M. Weber, *Storia economica. Linee di una storia universale dell'economia e della società*, 1919-1922, Roma, Donzelli, 1993, 298, who adfirms that capitalism needs "un diritto che si possa calcolare in modo simile ad una macchina". On the contract, specifically considered, N. Irti, *Un diritto incalcolabile*, 107, defines it a "contratto incalcolabile" far from the Weberian model which sees it as a form of economic rationality (M. Weber, *Economia e società*, Roma, Donzelli, 2019, 20).

destined to affect the litigation in terms of quantity, in terms of mere reduction. A deflationary effect will be accompanied by a qualitative redefinition of litigation[50].

Litigation takes, in fact, a completely new form in the case of disputes between the parties about self-executory clauses.

Two different scenarios may arise.

First of all, there is the possibility, although statistically infrequent, that the disputes concern the functioning of the clause itself and, therefore, the correctness, in terms of calculation, of the transaction carried out (for example, the amount of interest paid, the exceeding of a threshold).

It is also possible that it is not the operation of the clause but the activation itself of the clause that is called into question in court.

These are completely different situations.

In the first scenario, in fact, the judge has to face a question that concerns the reconstruction of the fact, as such, to be solved on an evidential level. It does not seem reasonable, however, to doubt the possibility for the party to contest the correctness of the transaction from a computational point of view. The tendential reliability of the algorithm, which is linked to its objective and functional characteristics, leads, however, to believe that the burden of proving the error is, by way of derogation from the general principles of obligations, on the person who deduces it, since the other party can rely on a simple, albeit relative, presumption of correctness of the calculation.

On the other hand, in the event that the dispute is related to the activation of the clause, a more exquisitely legal issue arises. The identification of the conditions and limits in which the functioning of a self-executing clause can be contested requires, in fact, a preliminary reflection on the characteristics of contractual automation.

4. *The automation between administrative decision and contract*

As seen at the beginning, the issue of contract automation is not among those traditionally examined by administrative doctrine. This makes the work of the interpreter particularly difficult, since he lacks, in his reconstructive work, direct and solid references.

The panorama of juridical reflection offers, however, some useful starting points.

First of all, by looking beyond the confines of our discipline, it is possible to count on the acquisitions of civil doctrine. In that sector, as mentioned above, scholars have been questioning the nature of smart contracts for some time now, converging on a few aspects.

If the civil doctrine is unanimous that smart contracts are subject to the discipline of private law[51], such a conclusion seems to be in line with the widely prevailing opinion in administrative doctrine about the legal nature of the administration's contracts[52]. Smart contracts remain acts of negotiation, with the obvious consequence that, as already mentioned, the subjective imputation of their legal effects must take place on a voluntary basis.

A further valid foothold in the reconstruction of the characteristics of contractual automation is offered, remaining within the perimeter of

[50] On this aspect J.A. Pérez Bastida, *Smart contracts y función judicial*, 334.

[51] *Amplius supra sub* par. 2.

[52] Thus the absolutely dominant doctrine that distinguishes it from the negotiating activity of private individuals for the functionalisation to the care of the public interest (G. Berti, *Il principio contrattuale nell'attività ammnistrativa*, 47, S. Civitarese Matteucci, *Regime giuridico dell'attività amministrativa e diritto privato*, in *Diritto pubblico,* 2003, 405). For a minority opinion with a markedly publicistic approach that brings the figure back under the dictation of art. 11 the General Law on Administrative Procedure of Italy no. 241 of 1990 E. Sticchi Damiani, *La nozione di appalto pubblico. Riflessioni in tema di privatizzazione dell'azione amministrativa*, Milano, Giuffrè, 1999. Spanish doctrine appears, instead, traditionally divided among the proponents of the *tesis sustancialista* (J. L.Villar Palasí, *Lecciones sobre contractación administrativa*, Madrid, Publicaciones de la Facultad de Derecho de la Universidad de Madrid, 1969 and F. Garrido Falla, *Sustancia y forma del contrato administrativo en Derecho español*, in *Studi in memoria di G. Zanobini*, Milano, 1965, vol. I, 525) and those who exclude, in discontinuity with the french tradition, the substantial importance of the exorbitant clauses that characterize its discipline (is the opinion of E. García De Enterría, *Dos regulaciones orgánicas de la contratación administrativa*, in *Revista de Administración Pública*, 1953, 10, 241 e ss.). France, on the other hand, has seen, thanks to the contribution made by the Conseil d'Etat (since Conseil d'Etat, du 10 janvier 1902, 94624 on the unilateral modifiability of the agreement by the administration), the elaboration of the notion of "*contrat administratif*" with its peculiarities in terms of legal nature (in doctrine G. Pequignot, *Théorie générale du contrata dministratif*, Paris, A. Pédone, 1945 and, more recently, L. Richer, *Droit des contrats administratifs*, Parigi, L.G.D.J., 2004; for a modern reinterpretation of the category, facing the challenges of the digital world L. Sourzat, *Le contrat administratif resilient*, Paris, L.G.D.J., 2019). The figure of *contrat administratif* was opposed in its exportability to the Italian experience, due to the absence of a specific positive discipline by M.S. Giannini, in *L'attività amministrativa*, Milano, Giuffrè, 1963 and by F. Ledda, *Il problema del contratto nel diritto amministrativo*, Torino, Giappichelli, 1962. The opposite opinion was substained by P. Virga, *Contratto ("diritto amministrativo"); teoria generale del contratto di diritto pubblico*, in *Enciclopedia del diritto*, IX, Milano, Giuffrè, 1961, 979.
In German law we find the "*öffentlich-rechtliche Vertrag*" (in doctrine K. Stern, *Zur Grundlegung einer Lehre des öffentlichrechtlichen Vertrags*, in *Verwaltungsarchiv*, Köln, Heymanns, 1958, 106), today defined in § 54 of the General Law on Administrative Procedure of Germany (Administrative Procedure Act of 25 May 1976, *Verwaltungsverfahrensgesetz – VwVfG*).

administrative law, by the theories developed with regard to administrative automation (that we can call "authoritative automation"). Only by highlighting the differences and the points of contact with the latter is it possible, in fact, to approximate, for subsequent steps, a satisfactory response.

It is necessary, in this regard, to start from an observation that may seem almost obvious: contractual and authoritative automation share the very delicate issue of the relationship between legal act and algorithm.

The algorithm is an element of continuity between the two cases. Both automation figures have to deal with the problem of its legal framework. The need for logical coherence requires, moreover, that this question must be tackled together, providing a coherent answer on both fronts.

There is, however, no unity of views in doctrine on the answer to be given.

According to a first approach, the algorithm would be, with all the evident repercussions in terms of protection, an administrative decision written on electronic support[53].

Another part of the doctrine questions its nature as a legal act, considering it rather as an operative instrument of administrative action[54]. Such a reconstruction has the undoubted merit of representing in an effective way the dynamic dimension of the phenomenon, especially with regard to those software that exploit artificial intelligence acting as a "virtual public agent"[55].

From a static point of view, the algorithm remains, instead, a logical procedure, expressible in machine language, which aims to solve a given problem through a finite number of elementary, clear and unambiguous instructions[56].

It is clear that the algorithm cannot be an administrative decision but, at most, the object of an administrative volition: the will, in particular, to make its own, in the exercise of public power, the instructions of which it is composed.

This suggests to remedy the traditional orientation by distinguishing between the algorithm itself and the legal vehicle on which it travels.

If it may happen that the algorithm is transferred into an administrative decision, it cannot, however, even be excluded *ex ante* that it may sometimes be contained in a regulatory act.[57]. This suggests, with greater caution, an eclectic approach, based on the discretionary criteria designed by doctrine and jurisprudence[58], to distinguish case by case when the algorithm takes one or the other semblance (with all the evident reflections in terms of legal protection[59] and ostensibility[60]). Therefore, the algorithm will

[53] A. Masucci, *L'atto amministrativo informatico*, 56, A. Usai, *Le prospettive di automazione delle decisioni amministrative in un sistema di teleamministrazione*, in *Diritto dell'informatica*, 1993, 164 and U. Fantigrossi, *Automazione e pubblica amministrazione*, Bologna, Il Mulino, 1993, 51. In a new perspective D. Marongiu, *L'attività amministrativa automatizzata*, Santarcangelo di Romagna, Maggioli, 2005, 87, excludes the direct qualification of the software as an administrative decision distinguishing between the moment of its elaboration (entrusted to technicians who are not administrative organs) and that of its approval by the administrative authority. In Spain I. Martín Delgado, *Naturaleza, concepto y régimen jurídico de la actuación admnistrativa automatizada*, in *Revista de Administración Pública*, 180, 2009, 353.

[54] A.G. Orofino, *La patologia dell'atto amministrativo elettronico: sindacato giurisdizionale e strumenti di tutela*, 2276 and A.G. Orofino and R.G. Orofino, *L'automazione amministrativa: imputazione e responsabilità*, in *Giornale di diritto amministrativo*, 2006, 12, 1300. To prevent its qualification as an administrative decision and, therefore, as a manifestation of will, would militate the consideration that it is expressed in machine language and not in Italian as prescribed in general by article 122 of the Italian Civil Procedure Code. The echo of this reconstruction can also be felt in the most recent italian jurisprudence: Consiglio di Stato, sec. VI, 13rd December 2019, n. 8472, that has observed that "il ricorso all'algoritmo va correttamente inquadrato in termini di modulo organizzativo, di strumento procedimentale ed istruttorio, soggetto alle verifiche tipiche di ogni procedimento amministrativo, il quale resta il modus operandi della scelta autoritativa, da svolgersi sulla scorta delle legislazione attributiva del potere e delle finalità dalla stessa attribuite all'organo pubblico, titolare del potere".

[55] By changing the expression ("funzionario virtuale") of V. Frosini, *L'informatica e la pubblica amministrazione*, in *Rivista trimestrale di diritto pubblico*, 1983, 484.

[56] For a definition of algorithm A.J. Greimas and J. Courtés, *Semiotica. Dizionario ragionato della teoria del linguaggio*, Milano, Mondadori, 2007, 5.

[57] Follow the thesis of the regulatory nature A. Boix Palop, *Los algoritmos son reglamentos: la necesidad de extender las garantías propias de las normas reglamentarias a los programas empleados por la administración para la adopción de decisiones*, in *Revista de Derecho Público: Teoría y Metodo*, 1, 2020, 223. The possibility that the programme could be based on regulatory sources had already been expressed, among some doubts, by D. Marongiu, *L'attività amministrativa automatizzata*, 97.

[58] In giurisprudence, the discrimination between the categories of regulatory and general administrative act is drawn in the light of the determinability *ex post* of the addressees of the act (recently Consiglio di Stato, Adunanza Plenaria, 4th may 2012, n. 9, in *Foro amministrativo – C.d.S.* 2012, 5, 1090, with the comment of N. Lupo, *Il Consiglio di Stato individua un criterio per distinguere tra atti normativi e atti non normativi*. In doctrine: M. Ramajoli, *Qualificazione e regime degli atti amministrativi generali*, in *Diritto amministrativo*, 1-2, 2013, 53-115 and G. Cocozza, *Riflessioni sul controllo giurisdizionale nei confronti dei regolamenti e degli atti amministrativi generali*, in *Federalismi*, 2/2017.

[59] Since A. Ravalli, *Atti amministrativi emanati mediante sistemi informatici: problematiche relative alla tutela giurisdizionale*, in *Rassegna TAR*, 1989, II, 261-262. It is clear that adhering to the thesis of the nature of administrative decision implies a burden of appeal against the act; on the other hand, adhering to the thesis of the normative nature allows the possibility, if necessary, also to disapply the regulatory act.

[60] This is one of the crucial fields of application of the

be contained in a regulatory act whenever it has not been designed *ad hoc* for a specific proceeding, but has been regulated through provisions with the characteristics of generality and abstractness, becoming, for this, a regulatory source, albeit secondary, on how public power is spent.

Except for the common element represented by the algorithm, contract and automated administrative decisions appear, for the rest, as profoundly different categories.

Reasoning *per differentiam*, the discriminating factor between them is certainly not to be sought on a structural level. The latter is an accidental aspect that reveals nothing of the most intimate nature of the act, nor of its relationship with the algorithm[61].

What distinguishes the two figures is the type of capacity spent by the administration. While the contract is an expression of private autonomy and, therefore, of its general capacity under private law, the administrative decision is expression of the public power[62].

This fundamental divergence, of substantial matrix, ends, in evidence, with conditioning both the foundation and the functioning of automation.

The adoption of the automated administrative decision involves the use, in whole or in part, of discretion granted by law to the administration[63]. So, it is the power itself, in its previous spending and, in particular, in the unilateral choice of the administration to opt for automation[64], to allow the definition of the scope and content of the administrative decision to be entrusted to the algorithm[65].

In smart contracts, on the other hand, the foundation of automation must be sought in the light of the private legal nature of the act. Here, as seen, the binding effect arises on a voluntary

principle of transparency. A more meaningful reading of the principle requires, in fact, that total accessibility should not only be guaranteed with regard to the final act but also to the way in which the administrative decision is reached. This requirement has been felt by the case law itself (Consiglio di Stato, sec. VI, 8th april 2019, no. 2270, with the comment of V. Canalini, *L'algoritmo come "atto amministrativo informatico" e il sindacato del giudice*, in *Giornale di diritto amministrativo*, 6, 2019, 781, and R. Ferrara, *Il giudice amministrativo e gli algoritmi. Note estemporanee a margine di un recente dibattito giurisprudenziale*, in *Diritto amministrativo*, 4, 2019, 773) which, moving from the idea that the same is an administrative act, has recognized the operation of the principle of transparency also with reference to the algorithm. The right of access to the algorithm of the management software of a procedure had already been recognized on the basis of similar arguments by T.A.R. Lazio, Roma, sez. III *bis*, 14th february 2017, no. 3769, in *Giornale di diritto amministrativo*, 2018, 5, 647 with the comment of I. Forgione, *Il caso dell'accesso al software MIUR per l'assegnazione dei docenti* and E. Prosperetti, *Accesso al software e al relativo algoritmo nei procedimenti amministrativi e giudiziali. Un'analisi a partire da due pronunce del TAR Lazio*, in *Diritto dell'informatica*, 4, 2019, 979. The doctrinal debate on the transparency of the algorithms underlying the functioning of public information systems is, moreover, in a more advanced state, outside Italy (B. Barraud, *L'algorithmisation de l'administraion*, 42 e A. Cerrillo I Martìnez, *How can we open the blackbox of public administration? Transparency and accountability in the use of algorithms*, in *Revista Catalana de Dret Públic*, 58, 2019, 13).

Recognising the regulatory nature of the act by which the algorithm is implemented poses the problem in partially different terms. This assumption gives rise, in fact, to the application of the provisions of Article 12 of Legislative Decree no. 33 of 2013, as amended by Article 11 of Legislative Decree no. 97 of 2016 and, therefore, a prior obligation to publish the act by the administration.

Of great interest is the recent ruling Consiglio di Stato, sec. VI, 13th december 2019, no. 8472, which has enucleated, starting from national law, some fundamental principles that must inspire the use of the algorithm. Among them appears the "principle of knowability" ("principio di conoscibilità") derived from art. 13, 14 and 15 of the European Regulation 2016/679 (General Data Protection Regulation - acronym GDPR), expression of the "Right to a good administration" referred to in art. 42 of the European Charter of Fundamental Rights. This means that "ognuno ha diritto a conoscere l'esistenza di processi decisionali automatizzati che lo riguardino ed in questo caso a ricevere informazioni significative sulla logica utilizzata".

[61] Apart from what are their typical forms of manifestation (unilateral for the authoritative act and bilateral or plurilateral for the negotiation one), there are cases in which the operation has a unilateral structure and cases in which the power is exercised through conventional forms (this is the hypothesis of the administrative agreements pursuant to art. 11 of Law no. 241 of 1990).

[62] F. Benevenuti, *Funzione amministrativa, procedimento, processo*, in *Rivista trimestrale di diritto pubblico*, 1952, 121.

[63] F. Follieri, *Logica del sindacato di legittimità sul provvedimento amministrativo. Ragionamento giuridico e modalità di sindacato*, Milano–Padova, Wolters Kluwers–Cedam, 2017, 364. They see discretion as a limit to automation because the computer can't "svolgere comparazioni di interessi e compiere scelte non predeterminate", D. Marongiu, *L'attività amministrativa automatizzata*, 60 e ss. e A.G. Orofino and R.G. Orofino, *L'automazione amministrativa: imputazione e responsabilità*, 1306. In jurisprudence, there has recently been a clearer openness towards the possibility of automating, through the use of algorithms, even discretionary activities. According to Consiglio di Stato, sect. VI, 13th december 2019, no. 8472, there are not "ragioni di principio, ovvero concrete, per limitare l'utilizzo all'attività amministrativa vincolata piuttosto che discrezionale, entrambe espressione di attività autoritativa svolta nel perseguimento del pubblico interesse". Because "ogni attività autoritativa comporta una fase quantomeno di accertamento e di verifica della scelta ai fini attribuiti dalla legge".

[64] It is, on closer inspection, an innovative perspective on themes already examined in doctrine (A. Police, *La predeterminazione delle scelte amministrative. Gradualità e trasparenza nell'esercizio del potere amministrativo*, Napoli, Edizioni Scientifiche Italiane, 1997).

[65] The mechanism would operate in a not dissimilar way also in the case in which one would have to opt for the thesis above mentioned of the regulatory nature of the act that defines the algorithm. In this case, it would be the regulatory act that would model the morphology of power by reducing and eliminating the profiles of discretion provided by the primary rule.

and equal basis, since each party accepts automation in the exercise of its private autonomy. Each party, at the moment of the stipulation, freely binds itself to the meaning of the contractual provision as normalized by the algorithm.

This marks another difference between authoritative and contractual automation. While the contractual one is based on a choice made by the parties at the time of the stipulation of the contract and, therefore, it is realized *unico actu*, the authoritative one requires at least three distinct basic moments: that of the predetermination of the rules for the creation of the algorithm (by means of a general administrative act or a regulatory act), that of the use of the algorithm as an administration tool and, finally, that of the transposition of the result of the computational operation conducted by the algorithm into an administrative decision having external effectiveness.

The legal framework of this particular case, in which the content and effects of the contract are the subject of a will mediated by the algorithm, depends on the legal vehicle on which the algorithm travels.

If the algorithm is poured into a regulatory act, the phenomenon can be embedded, without any theoretical difficulty, under the dictates of article 1374 of the Italian Civil Code[66]. Thus, there would be a hypothesis of integration of the contract with external reference to the "law," intended in the broad sense, including the regulatory acts of secondary rank[67].

The answer becomes more problematic if the algorithm were to be transposed into a non-regulatory administrative act. In fact, in such a case, it would not be possible to invoke the provisions of art. 1374 of the Italian Civil Code, which does not include the administrative decisions among the sources of hetero integration of the contract.

It is necessary to look, in this second hypothesis, at a different model, capable of explaining the interactions between authoritative determination and agreement of the parties.

At a first reflection, it seems that there is a certain affinity, at least on a functional level, with the mechanism referred to in article 1341 of the Italian Civil Code. The administrative act that puts the algorithm at the basis of the automation of the clauses could be assimilated to the general conditions of the contract prepared unilaterally by one of the parties to regulate serial relationships.[68]. Although not expressly accepted, they are "*efficaci nei confronti dell'altro, se al momento della conclusione del contratto questi le ha conosciute o avrebbe dovuto conoscerle usando l'ordinaria diligenza*"[69]. This poses the delicate issue of the *ex ante* knowability by the private party of the algorithm. It seems, rather, that, from the point of view of art. 1341 of the Italian Civil Code, the contracting party must be assured the possibility, even before the stipulation, to be aware of the concrete operational methods of automation. And for this purpose it could be sufficient, at least in the public evidence, the provision, in the initial announcement, of a specific part, also in the form of the technical annex, which explains the content of the algorithm[70].

The different framework which it is possible to give to the phenomenon, even if it has some intuitable repercussions on the applicable regime, does not, however, affect the actual operativity of the automated clauses. Whatever approach is followed, in fact, in contract automation there is no space for legal uncertainty about their functioning.

The normalization of legal language eliminates any possible profile of ambiguity: among the possible meanings of the lemma or

[66] In the background lies the heated debate in the civilist doctrine on the extent of the phenomenon of contractual integration and, in particular, whether the same should refer only to the effects of the contract (A. Cataudella, *Sul contenuto del contratto*, Milano, Giuffrè, 1974, 149 and F. Ziccardi, *L'integrazione del contratto*, in *Rivista trimestrale di diritto e procedura civile*, 1969, II, 134, that enhance the textual and topographical data of the provision) or its content (C. Varrone, *Ideologia e dogmatica nella teoria del negozio giuridico*, Napoli, Jovene, 1972, 291).

[67] In jurisprudence (Cassazione Civile, sec. I, 29th september 2004, no. 19531) "il termine 'legge', secondo l'opinione prevalente in dottrina, deve intendersi, atecnicamente, in senso ampio, onde è riferibile a qualsiasi norma avente valore di legge in senso sostanziale e, quindi, non soltanto ai provvedimenti muniti della veste formale di atti legislativi ma altresì ai regolamenti".

[68] In doctrine C.M. Bianca, *Condizioni generali di contratto: I) Diritto civile*, in *Enciclopedia giuridica*, VII, Milano, Giuffrè, 1988 and S. Patti, *Le condizioni generali di contratto*, Padova, Cedam, 1996.

[69] Literally "effective towards the other, if at the time of the conclusion of the contract he knew them or should have known them using ordinary diligence". A detachment from the voluntaristic paradigm in favor of that of objective knowability according to ordinary diligence is highlighted by N. Irti, *Scambi senza accordo*, in *Rivista trimestrale di diritto e procedura civile*, 1998, 1, and G. Oppo, *Disumanizzazione del contratto?*, in *Rivista di diritto civile*, 1998, I, 525. It seems, however, that the thesis, which has been quite successful in more recent times, of the normative nature of the general conditions of the contract has definitively disappeared, since the doctrine has shifted the focus to the issue of the need for judicial control of the conditions based on the principles establishing limits to private autonomy. (G. Alpa and M. Bessone, *I contratti standard nel diritto interno e comunitario*, Torino, Giappichelli, 1991, 31).

[70] In this sense, it would seem appropriate to use models of announcements that indicate in the form of open data and in machine language, within an appropriate annex, the algorithm that will be used.

phrase used, only one is identified and expressed in binary language, where *tertium non datur*.

The circumstance that the parties have accepted the automation wanting those specific effects is to exclude the predictability of interpretations of the text different from those formalized in the algorithm. The interpretation of the contract becomes a "non-problem" because is the parties who have defined with absolute precision, *more geometrico*, the content and scope of the contract. Object of consent is, in fact, no longer a traditional text but a text that the parties accepted in the binary formulation made explicit by the algorithm. And *in claris non fit interpretatio* because in front of a text, expressed in machine language, never ambiguous and obscure, there is no margin left for an activity aimed at clarifying the meaning of the statements.

We have to deal with a phenomenon that is far more significant than an authentic interpretation of the contract given by the parties[71]. While, in fact, every hermeneutic activity, including the authentic one, necessarily follows from a temporal point of view the adoption of the act, in the case of contractual automation, the implementation of the algorithm takes place in the genetic phase by opting for automation, so that the contract has, *ab origine*, since its formation, a meaning (and therefore a content) that is only that, unequivocal and never obscure, expressed in machine language[72].

These considerations are valid, to go back to the question put at the end of the previous paragraph, to exclude any possibility for the parties to challenge, in court, the functioning of the self-execution clauses. Any judicial initiative of the parties in this sense would be contrary to the canon of objective good faith, which prohibits *venire contra factum proprium*, and would, as such, be paralysed by raising the *exception doli generalis seu praesentis*[73].

From this point of view, contract automation is, once again, a radically different phenomenon from the authoritative automation.

In the contractual automation both parties agree on an equal basis on the identification, as the only meaning of the linguistic expression used, of the one made explicit by the algorithm[74].

On the contrary, in authoritative automation this is done unilaterally by the public party that, as power holder, elaborates the algorithm. The result is a relationship whose definition is not shared but authoritatively "suffered" by the other side.

It's intuitive that this brings consequences on litigation.

In authoritative automation arise a concrete problem of protection of the position of the recipient of the automated decision with respect to the way in which the public power is spent.

Thus, the need to ensure a review of the automated administrative decision, also in terms of interpretation of the same, reappears overwhelmingly: a task, this, reserved for the Administrative Judge as "judge of the public power"[75].

[71] For a dogmatic definition of authentic interpretation H. Kelsen, *Reine Rechtslehre*, 2, *Vollständigneubearbeite und erweirte Auflage*, Wien, 1960. Under his opinion the text of the juridical act ideally designs a framework of alternative, multiple and different meanings. The authentic interpretation, bearing in mind this frame of meanings, imposes authoritatively and with preclusive efficacy the chosen meaning, to the exclusion of all others. M. S. Giannini, *L'interpretazione dell'atto amministrativo e la teoria giuridica generale dell'interpretazione*, Milano, Giuffrè, 1939, 94, keeps the phenomenon of authentic interpretation distinct from that of interpretation; in the administrative field and in particular with regard to the administrative decision see in particular the monographic work of M. Monteduro, *Provvedimento amministrativo ed interpretazione autentica*, Padova, Cedam, 2012.

[72] According to E. Gabrielli, *La nozione di contratto e la sua funzione. Appunti sulla prospettiva di una nuova definizione di contratto*, in *Giustizia civile*, 2019, 2, 299, "il contratto è strutturato, in sintesi, mediante algoritmi che rappresentano la trasposizione in termini informatici della volontà delle parti di concludere un determinato contratto e di darvi in seguito esecuzione".

[73] On this remedy that goes back to the roman tradition, designed to deal with claims not worthy of protection, see, for a general overview and further bibliographical references, A. Torrente, *Eccezione di dolo*, in *Enciclopedia del diritto*, XIV, Milano, Giuffrè, 1965, 218. In jurisprudence the remedy has been applied in Cassazione Civile, sez. un., 4th november 2019, no. 28314. Going to sanction the unfair exercise of rights of substantial matrix on the procedural level, the *exception doli generalis seu praesentis* is linked to the theme of the abuse of the trial (in doctrine, as far as the administrative process is concerned, see G. Tropea, *L'abuso del processo amministrativo*, Napoli, Edizioni Scientifiche Italiane, 2015).

[74] This is obviously not valid to exclude the practicability of the remedies provided, both by common law and by sectorial regulations, against situations of economic or regulatory imbalance of the contract (such as, traditionally, the instrument of termination for excessive onerousness occurred pursuant to art. 1467 of the Italian Civil Code or termination for *ultra dimidium* disparity pursuant to art. 1448 of the Italian Civil Code).

[75] The difficulties of a penetrating and satisfying judicial review of the automated exercise of public powers are well highlighted by J.-B. Auby, *Contrôle de la puissance publique et gouvernance par algorithme*. The problem of the intensity of judicial control on automated decisions is related to the issue of the imputation of responsibilities arising from the pathological spending of authoritative powers. Power and responsibility, as in the figure of the 'Möbieus ribbon', are faces of a single plane so that, according to the always valid teaching of S. Rodotà, *Il diritto di avere diritti*, Bari, Laterza, 2015, 403, the use of the algorithm with "l'imputazione impersonale del potere a una entità esterna non può divenire la via per esercitare un potere senza responsabilità" (on the role of responsibility as the closing of the circuit of legitimation of administrative powers see the considerations of F. Merusi, *La*

5. *The "incomplete" contract and the solutions offered by artificial intelligence*

Contract automation is certainly not risk-free.

The threats, also for the contracts of the administration, are those already highlighted by the civil doctrine and are related to the two aspects of the normalization of the language and the completeness of the negotiation regulations.

The normalization of the contractual language represents a specific declination of the more general theme of the normalization of legal language[76]. As happens with the law, also for the contract, transposition into machine language encounters serious and often insuperable difficulties when it is necessary to use naturally indefinite expressions, elastic notions or general clauses[77]. In such hypotheses any attempt to fill the notion of specific contents in the algorithmic formalization through very detailed lists, bears the risk, on the one hand, of depowering the expansive force of such concepts, on the other hand, of sclerotizing their application depriving them of their, often indispensable, flexibility[78].

Contractual automation offers, however, because of its peculiarities, in comparison with authoritative automation, some undeniable resources.

In this sense, it seems that a first remedy to the drawbacks inherent in the normalization of the legal language can be identified in the choice to automate only partially the contract and, in particular, only those provisions that lend themselves for their structure to be converted in binary form and, therefore, to be easily transposed into machine language. This would give rise to a composite contract, only in part traditional, intended, as regards its non-self-executive clauses, to be interpreted and implemented, as usual, by the parties.

It should not, however, be overlooked that, compared to the law, with its general and abstract nature, the contractual language can assume a higher level of concreteness. In order to overcome the inconveniences that may arise during the normalization process; therefore, it is possible to intervene on the methods and techniques of drafting the act. This requires a different cultural approach, who prefer to use, when drafting the contract, a language closer to that of the machine. In this sense, the use of standard contracts specifically designed to be combined with a specific algorithm could prove very useful for administrations.

The other risk involved in contract automation is that of the incompleteness of the contractual provisions. The presence of regulatory gaps inhibits, in fact, the very functioning of the self-executing clauses in the event of cases that are not expressly regulated, as this could lead to a stalemate in the implementation of the contractual relationship[79].

On closer inspection, this drawback is nothing different than the projection of the gnoseological problem of the completeness of logical-formal systems and of the existence of intrinsic limits to their decidability and computability[80].

responsabilità dei pubblici dipendenti secondo la Costituzione: l'art. 28 rivisitato, in *Rivista trimestrale di diritto pubblico*, 1986, 11, V. Ottaviano, *Dovere di rendere pubblico conto, responsabilità dei dirigenti e determinazioni di indirizzi e programmi*, in Id., *Scritti giuridici*, vol. III, Milano, 1992, 385, and G. Berti, *La responsabilità pubblica (Costituzione e Amministrazione)*, Padova, Cedam, 1994).

[76] In Italy see N. Bobbio, *Scienza del diritto e analisi del linguaggio*, in *Rivista trimestrale di diritto e procedura civile*, 2, 1950, 342 and in the United Kingdom: G.L. Williams, *Language and the Law*, in *The Law Quarterly Review*, 1945, 71, who inaugurate reflections that will be deepened by L. Nivarra, *Come normalizzare il linguaggio legale*, in *Contratti e impresa. Dialoghi con la giurisprudenza*, Padova, Cedam, 1987, 262, F. Socci, P. Mariani and D. Tiscornia, *Metodologia di normalizzazione del linguaggio giuridico,* in *Informatica e diritto*, 1984, 10, 307, M. T. Sagri and D. Tiscornia, *Linguaggio giuridico e conoscenza delle norme*, in *Informatica e diritto*, 2008, 34, 265. On the subject of standardisation of legal language with specific regard to the automation of administrative choices of authoritative nature: D. Marongiu, *L'attività amministrativa automatizzata*, 33.

[77] Think, among all, about the canon of good faith, which marks the contractual relationship throughout its life, from its formation (art. 1337 Italian Civil Code) to its execution (art. 1375 Italian Civil Code).

[78] To remain in the example of the previous note, it would be necessary to typify the highest possible number of cases of behavior contrary to the criteria of loyalty and fairness. Describes it as a "*rigidification*" of the contract G. Cattalano, *La décision du contractant au prisme de l'intelligence artificielle*, 88, noting that "C'est ainsi que de façon très paradoxale, l'automatisation prive les décisions unilatérales des contractants d'une partie de leur utilité".

[79] This would cause what J.A. Pérez Bastida, *Smart contracts y función judicial*, 333, defines an "*incumplimiento involuntario*" because "la parte tiene un claro ánimo de cumplir pero por la falla en el mecanismo técnico no se realiza el acto físico o real de cumplimiento".

[80] See, on this point, first of all, the teachings of the most importanty logician of the 20th century K. Gödel, *Über formal unentscheidbare Sätze der principia mathematica und verwandter Systeme*, in *Monatschefte für Mathematik und Physik*, 38, 1931, 173-198. By counteracting David Hilbert's aspirations to the construction of a universal mathematical formalism (the so-called "*Entscheidungsproblem*" or "decision problem"), it has been shown that any system that allows to define natural numbers (and, therefore, the arithmetic itself) is necessarily incomplete, contending for information that cannot be demonstrated, not even by adding a statement to the set of axioms, neither truth nor falsehood. The father of the discipline reflected on the implications of this theorem of incompleteness on the science of information and the construction of algorithms: A.M. Turing, *On computable numbers, with an application to the Entscheidungsproblem*, in *Proceedings of the London Mathematical Society*, 42, 1936, 230-265.

On the problem of incomplete legal language, see N. Bobbio, *Scienza del diritto e analisi del linguaggio*, 355 ff.

This is, moreover, a subject already very much examined by economic science[81] but which has undoubted and intuitable legal repercussions[82] especially under the aspect of the efficiency of administrative action[83].

If, therefore, the contract in its algorithmic formalization is destined to be a system that is naturally and necessarily incomplete, a response to the resulting inconveniences may, nevertheless, be sought precisely in econometric studies and, in particular, in the theories on the allocation of the right of choice[84].

In order to remedy the existence of gaps, the same contract should assign *ex ante* to one of the parties what is called the "property right", meaning the right to set the missing rule[85].

The functional relevance of the public interest in the administration's contracts[86] leads to believe that such a right should be properly granted to the public party.

Not that its attribution to the administration is neutral in itself. It is a circumstance which must of course be taken into account in terms of the economic equilibrium of the agreement, since it represents a risk taken by the private party to the agreement, which is exposed to the possibility of the adoption of an unfavorable rule.

But it will be, in legal terms, a risk that is not hidden, but explicit and consciously assumed; in purely economic terms it would not undermine the efficiency of the exchange, since the private counterparty is in a position to give a price,

who hopes the "*purificazione*", "*completamento*" and "*ordinamento*" of legal language.

There is ample literature on the subject of the completeness of the legal system as a normative system (in Italy since S. Romano, *Osservazioni sulla completezza dell'ordinamento statale*, in *Pubblicazioni della facoltà di Giurisprudenza della Regia Università di Modena*, 1925, n. 7, II, which takes up and completes the considerations already made in the previous work *L'ordinamento giuridico*, Pisa, 1918, 183).

[81] It is the *theory of incomplete contracts* by the Nobel prize O. Hart, *Firms, Contracts, and Financial Structure*, Oxford, Oxford University Press, 1995.

[82] For a juridical analysis of this issue A. Fici, *Il contratto incompleto*, Torino, Giappichelli, 2005 e E. Guerinoni, *Incompletezza e completamento del contratto*, Milano, Giuffrè, 2007.

[83] The issue of the incompleteness of the contracts and the reflection on the functioning of the administrative apparatus have been explored by the current of the *New Public Management*. In particular N. Meccheri, *La struttura e il funzionamento del governo e della Pubblica amministrazione come "nexus" di contratti*, in *Economia Politica, Journal of Analytical and Institutional Economics*, vol. 3, 2002, 471-508 and T.L. Brown, M. Potoski and D.M. Van Slyk, *Trust and contract completeness in the public sector*, in *Local Government Studies*, Abingdon on Thames, 2007, 607-623, A.M. Bertelli and C.R. Smith, *Relational contracting and managing networks: new public management and the search for gains from repeated interaction*, paper prepared for the Bi-annual Meeting of the Public Management Research Association on 1st October (Los Angeles, CA), later published as *Relational Contracting and Network Management*, in *Journal of Public Administration Research and Theory*, vol. 20, Issue supplement no. 1, January 2010, Oxford, Oxford University Press, 2010, 21-40.

[84] It is the very successful thesis elaborated by O. Hart and J. Moore, *Property Rights and the Nature of the Firm*, in *Journal of Political Economy*, 1990, 98.

[85] *Ibidem*, 99.

[86] According to the prevailing opinion in Italian doctrine, the public interest would remain relegated to the outside of the structure of the contract (F. Trimarchi Banfi, *I rapporti contrattuali della pubblica amministrazione*, in *Diritto pubblico*, 1998, 35, and F. Ledda, *Il problema del contratto nel diritto amministrativo*, Torino, 1964, now in *Scritti giuridici*, Milano, Giuffrè, 2002, 52). There were, however, already in the pre-republican age, Authors who had already grasped, although still moving in the perspective of the so-called abstract cause theory, the importance of the public interest in defining the functional profile of the contract. Among them: P. Bodda, *Ente pubblico, soggetto privato e atto contrattuale*, Pubblicazioni della Regia Università di Pavia, 1937, 62, V. Gallo, *I rapporti contrattuali nel diritto amministrativo*, Padova, Cedam, 1936, 73, M. Cantucci, *L'attività di diritto privato della pubblica amministrazione*, Padova, Cedam, 1942, 38 e L.V. Moscarini, *Profili civilistici del contratto pubblico*, Milano, Giuffrè, 1988, 81.

The most recent regulatory developments seem, however, to be pushing towards the emergence of the public interest as a causal factor of the contract. In this direction goes the Legislative Decree no. 53 of 2010, which, in transposing the european directive, gave the judge a power to "regulate the contract", the exercise of which is guided by evaluations that relate, for the most part, to the concrete pursuit of the public interest (*amplius* G. Gallone, *Annullamento d'ufficio e sorte del contratto*, 151).

The publicity relevance of the contract execution phase has been clearly stated by Consiglio di Stato, Adunanza Plenaria, 2nd april 2020, no. 10, starting from strongly derogatory rules drawn by the Code of Public Contracts in art. 100 and following (this opinion has been expressed in G. Gallone, *Annullamento d'ufficio e risoluzione del contratto pubblico. Nuove prospettive alla luce del codice dei contratti pubblici e del correttivo del 2017*, 57).

From a comparative point of view, interesting ideas for overcoming the dogma of the random irrelevance of the public interest in the contracts of the administration comes from the french doctrine: F. Lehoux, *La pénétration des notions civilistes d'objet et de cause du contrat dans le contentieux des marchés publics*, in *Contrats publics*, 2016, 169, 39 e F. Lombardi, *La cause dans le contrat administratif*, Paris, 2008, relying on the notion of "*exorbitance*", that is a characteristic of the "*contrats administratifs*". These reconstructions must, today, come to terms with the recent French reform of contract law, set out in the *Ordonnance* of 10 February 2016, one of the new features of which, with a view to simplifying the rules, is the disappearance of the cause as a requirement for the validity of the contract (provided for in the old text of Article 1108 of the French Civil Code). As has been observed by several parties (D. Mazeaud, *Prime note sulla riforma del diritto dei contratti nell'ordinamento francese*, in *Rivista di diritto civile*, 2016, 2, 440, and L. Pontiroli, *Morte e trasfigurazione della causa (ed altre catastrofi) nel code civil*, in A. Fusaro and E. Gabrielli (eds.), *La riforma dei contratti in Francia*, in *Giurisprudenza italiana*, 2018, 1229), this does not make it possible to conclude in the sense of the final sunset of the most famous of the notions of French law of obligations, which, on the other hand, continues to appear between the folds of the Code Civil (among all of them in art. 1162, which provides for a control as to whether the "purpose" of the contract is not contrary to public policy).

internalizing the relative cost through the concrete calibration of the economic offer.

The provision of a "*meta-rule*" on the basis of which it is the administration that sets the contractual discipline in the hypothesis of incompleteness of the original regulation poses, moreover, prospects of certain interest in terms of automation. Once the right of property has been assigned to the public party, it will be possible to use an algorithm, already identified at the time of stipulation, to which to entrust the identification of the missing rule. To this end, the most recent achievements in terms of artificial intelligence[87] as well as the disruptive technology of machine learning can become very useful.

The *deep learning*[88] technology represents the most fertile field of machine learning research. It involves the use of complex architecture models, based on several levels of representation, corresponding to hierarchies of characteristics, factors or concepts. In it, the highest level concepts are defined, through inferential mechanisms, on the basis of the lowest ones. It is, therefore, a model that is well suited, in general, to the analytic-deductive reasoning of the jurist, but that even better allows to derive, as in the case of the praxeological *lacuna*, a new rule from those already existing.

The insertion of the contract in a blockchain ecosystem, characteristic, as seen, typical of smart contracts, would allow, then, the computer to access, in the calculation operations aimed at the construction of the missing contractual rule, to a single database. In this way, it will be possible to verify whether a similar event has already occurred in the application of the same standard contract and what, if so, the rule developed to fill the gap.

Specularly, in the hypothesis in which the contractual rule is to be elaborated *ex novo*, the answer given by the algorithm will also flow into the distributed register in such a way that it will be allowed also in the future to apply it in similar cases.

The advantages of using artificial intelligence to fill the negotiation gap are different. Among all of them, the importance of the homogeneity of solutions (which will be identical in identical cases) and, not less important, the predictability of the same solutions, also in order to guarantee the coherence and logicality of the administrative action in the contractual field. It would, in fact, *de facto* bring to the construction of a new rule of negotiation which would integrate the discipline of the standard contract, further reducing that uncertainty which is the perfect context of maladministration phenomena, especially with regard to the execution of the contract.

From a theoretical point of view, it does not seem, however, that the technical solution just described poses particular problems of compatibility with what are the essential requirements of the object of the contract ("oggetto", intended in a broad sense as synonymous with the content of the contract[89]) and, in particular, with the requirements of certainty and determination imposed by art. 1346 of the Italian Civil Code.

According to that provision, it is, in fact, sufficient that the content of the contract can even be determined *ex post*, as long as that this is possible on the basis of objective and predetermined criteria.

The use of an algorithm in the determination of the object of the contract, even though, for obvious technical reasons, it could not be contemplated by the drafters of the Civil Code of 1942, can, thus, be traced back to those figure that allow a definition in progress of the contract.

It would be possible to hypothesize, for example, the recourse to the figure of the so-called "arbitraggio" ("arbitration") pursuant to art. 1349 of the Italian Civil Code[90]. It provides, in particular, that "la determinazione della prestazione dedotta in contratto" ("the determination of the benefit deducted in the contract") may be "deferita a un terzo" ("referred

[87] The relationship between artificial intelligence and contract has also been probed by french doctrine: M. Mekki, *Intelligence artificielle et contracts*, in A. Bensaumon and G. Loseaua (eds.)*, Droit de l'intelligence artificielle*, 2019, Paris, Librairie générale de droit et de jurisprudence (L.G.D.J.), 131. Defines artificial intelligence as an "*acteur de la decision contractuelle*" F. Dournaux, *La légitimité de decisions contractuelles emanant d'une intelligence artificielle*, 91 ff., in *La decisione nel prisma dell'intelligenza artificiale*, E. Calzolaro (ed.), Padova, Cedam, 2020.

[88] For its definition L. Deng and D. Yu, *Deep Learning: Methods and Applications*, in *7 Foundations and Trends in Signal Processing*, 2013, 197.

[89] On the natural polysemicity of the expression "oggetto del contratto" ("object of the contract") and on the different meanings in which the lemma has been used by doctrine over time R. Fiori, *Il problema dell'oggetto del contratto nella tradizione civilistica*, in *Modelli teorici e metodologici nella storia del diritto privato. Obbligazioni e diritti reali*, R. Cardilli (ed.), Napoli, Jovene, 2003, 171.

[90] On this theme T. Ascarelli, *Arbitri ed arbitratori*, in *Studi in tema di contratto*, Milano, Giuffrè 1952, A. Catricalà, *Arbitraggio*, in *Enciclopedia giuridica*, Roma, Treccani, 1988, II, 4, G. Zuddas, *L'arbitraggio*, Napoli, Jovene, 1992, F. Criscuolo, *Arbitraggio e determinazione dell'oggetto del contratto*, Napoli, Iesi, 1995, C.D. Malagnino*, Il terzo arbitratore nell'integrazione del negozio giuridico*, Milano, Cedam, 2010. On the German legal experience, where the theoretical construction on the point appears to be much more elaborate, in a comparative perspective see M.C. Dalbosco, *L'arbitraggio di parte nel sistema tedesco del BGB*, in *Rivista di diritto civile*, II, 1987.

to a third party"), specifying that this must take place on the basis of a "equo apprezzamento" ("fair assessment") or, where expressly provided for by the parties, even on the basis of "mero apprezzamento" ("mere arbitrariness"). In both cases it is possible to challenge the determination before the Judge denouncing its manifest unfairness or erroneousness[91].

This figure was evidently conceived the legislator with a third-party (physical person) arbitrator in mind[92]. Nothing prevents, however, in the light of *ratio* and purpose of the figure, to extend its scope to those cases in which the determination of the object is entrusted not to a natural person but to an algorithm.

There are several arguments that push in the direction of the analogical applicability of the prediction.

First of all, from a theoretical point of view, the doctrinaire debate on the possibility of recognizing a legal subjectivity of the algorithm has been open for some time now.

On the other hand, this issue is to a large extent defused by doctrinal acquisitions about the legal nature of the arbitrator's determination. The idea that the arbitrator's determination has contractual substance now appears recessive in favor of another, preferable, that considers it a legal act in the strict sense of the word[93]. His determination, moreover, constitutes the integration of the contract and its effects are produced by the will of the parties themselves, who have decided to entrust the integration to a third party.

Finally, the algorithm ensures compliance with the requirement of determinability on an objective basis of the content of the contract. The outcome of the integration of the contractual settlement follows, in fact, a computational operation whose result, if the factors are known, can always be determined *ex ante*[94].

Moreover, it is the same art. 1346 of the Italian Civil Code to suggest which must be the parameters to follow in the construction of the algorithm intended to complete the contractual regulation. The main one is certainly represented by the fairness (the "equo apprezzamento") evoked by the first paragraph of the provision. It is to be intended as a balancing of the opposing positions of the parties and, therefore, of the quantum-qualitative weight of the reciprocal act of execution[95]. A balancing that should not be conceived, in any case, in an absolute and rigorous manner but contained within the extreme limit of manifest iniquity[96].

6. *Some brief, provisional, reflections*

The previous reflections seem to demonstrate how, still moving within the context of the private law provisions of the Civil Code, there is the possibility to fully exploit the potential of smart contracts in the administrative field.

Contract automation is already a reality in some important sectors of the economy and it does not seem daring to say that many economic agents will soon feel the need to experience its advantages also in relations with the public contractor.

The right to use the technologies set forth in art. 3 of the Italian "Codice dell'Amministrazione Digitale" will be soon filled with new content, coming out of a purely procedural declination[97].

[91] However, there is a burden, for the sole case of determination on the basis of mere arbitrariness, to prove the bad faith of the third party - arbitrator.

[92] This is clearly confirmed, if necessary, by the reference to the subjective status of bad faith as a condition of appeal for the case of determination on the basis of mere arbitrariness.

[93] Uses the scheme of the mandate with representation T. Ascarelli, *Arbitri ed arbitratori*, 205.

[94] Reasoning *a fortiori*, the use of the algorithm offers even greater guarantees than the other possibility, expressly recognized by the Code in paragraph 3 of art. 1349 of the Italian Civil Code, of entrusting the determination to the "mere arbitrariness" of the third party, meaning an absolutely free choice not anchored to any predetermined objective criteria.

[95] A useful starting point in the construction of the algorithm could come from the provisions of art. 1371 of the Italian Civil Code, closing rule on the interpretation of the contract, according to which "deve essere inteso nel senso meno gravoso per l'obbligato, se è a titulo gratuito, e nel senso che realizzi l'equo contemperamento degli interessi delle parti, se è a titulo oneroso".

[96] Cassazione Civile, sec. III, 30th june 2005, no.13954, su *Giustizia civile massimata*, 2005, 6, according to which "con la clausola di arbitraggio, inserita in un negozio incompleto in uno dei suoi elementi, le parti demandano ad un terzo arbitratore la determinazione della prestazione, impegnandosi ad accettarla. Il terzo arbitratore, a meno che le parti si siano affidate al suo 'mero arbitrio', deve procedere con equo apprezzamento alla determinazione della prestazione, adottando cioè un criterio di valutazione ispirato all'equità contrattuale, che in questo caso svolge una funzione di ricerca in via preventiva dell'equilibrio mercantile tra prestazioni contrapposte e di perequazione degli interessi economici in gioco. Pertanto l'equo apprezzamento si risolve in valutazioni che, pur ammettendo un certo margine di soggettività, sono ancorate a criteri obbiettivi, desumibili dal settore economico nel quale il contratto incompleto si iscrive, in quanto tali suscettibili di dare luogo ad un controllo in sede giudiziale circa la loro applicazione nel caso in cui la determinazione dell'arbitro sia viziata da iniquità o erroneità manifesta, il che si verifica quando sia ravvisabile una rilevante sperequazione tra prestazioni contrattuali contrapposte, determinate attraverso l'attività dell'arbitratore".

[97] For more extensive bibliographical references A.G. Orofino, *Forme elettroniche e procedimenti amministrativi*, 144. In Spain with special regard to Ley n. 11 del 22 giugno 2007, L. Cotino Hueso, *El derecho a relacionarse electrónicamente con las Administraciones y el estatuto del ciudadano e-administrado en la Ley11/2007 y en su normativa de desarrollo*, in *La Ley de administración*

The new season of "contractual digitization" that seems to be looming on the horizon requires, however, a serious commitment, not only of intellectual kind.

The many legal issues surrounding the figure of smart contracts will still raise doubts and uncertainties, especially in the operational field, and the answers to some of them are evidently far from being definitive.

But this is a challenge that deserves to be met.

What is at stake is not, in fact, the simple efficiency of administrative action but, more generally, the rebalancing of the digital divide that continues to dig between the public sphere and the economic world[98].

electronica. Comentario sistemático a la Ley 11/2007, de 22 junio, de acceso electrónico de los ciudadanos a los servicios públicos, II ed., E. Gamero Casado and J. Valero Torrijos (eds.), Cizur Menor, Aranzadi, 2010, 188, J.L. Blasco Díaz, *Los derechos de los ciudadanos en su relación electrónica con la Administración*, in *Revista Española de Derecho Administrativo*, 2017, 791. In France P. Sucevic, E. Debies and W. Boutanos, *Ordonnance relative aux échanges électroniques entre les usagers et les autorités administratives et entre les autorités administratives*, in *Le courrier juridique des finances et de l'industrie*, 2006, 37.

[98] The concept of "*digital divide*" was born in the United States under the administration of Bill Clinton to express the gap between those who have an effective excess of information technology and those who are totally or partially excluded from it (for its social and economic effects please refer to the studies of M. Warschauer, *Technology and social inclusion: Rethinking the digital divide*, Boston, MIT Press, 2004 e K. Mossberger, C.J. Tolbert, and M. Stansbury, *Virtual inequality: Beyond the digital divide*, Washington, DC, Georgetown University Press, 2003). This digital divide, previously perceptible only in the relationships between different classes of private users, today is increasingly evident also in the relationships between the economic world and the public decision-maker. Unlike what happened at the dawn of computerization, public administrations often find themselves forced to chase the forces of the market in terms of technology. It seems, therefore, very topical the warning launched by S. Rodotà, *Il diritto di avere diritti*, 403, to a return to public law guarantees through the construction of "un adeguato contesto istituzionale" in order to avoid that "il rapporto sempre più importante tra l'uomo e la macchina venga governato solo dalla logica economica". The public-private digital divide involves, in fact, a detriment of the demands of justice and substantial equality and an increasing polarization of wealth (J.E. Stiglitz, *The price of inequality: How Today's Divided Society Endangers Our Future*, New York, W.W. Norton & Company, 2012).